SER. II, VOL. 22 No. 3

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THE NEW YORK ACADEMY OF SCIENCES

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The Sections and the Divisions hold meetings regularly, one evening each month, during the academic year, October to May, inclusive. All meetings are held at the building of The New York Academy of Sciences, 2 East Sixty-third Street, New York 21, New York.

Conferences are also held at irregular intervals at times announced by special programs.

SER. II, VOL. 22 *January 1960* NO. 3

TRANSACTIONS
OF
THE NEW YORK ACADEMY OF SCIENCES

Editor in Chief
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Associate Editor
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Executive Director: EUNICE THOMAS MINER

REPORT OF THE ANNUAL MEETING

December 3, 1959

The 142nd Annual Meeting of the Academy for the election of Fellows, the presentation of reports, and the transaction of other business, was held at the Academy Building on the evening of Thursday, December 3, 1959.

The first order of business was devoted to the reports of the Officers and Committees of the Academy.

REPORT OF OFFICERS AND COMMITTEES

Report of the Chairman of the Board of Trustees

As a result of an overwhelming vote of the Membership of the Academy ratifying the proposed revision of the Constitution, the governmental structure of the Academy has been reorganized to include a Board of Trustees and a Scientific Council.

By this change, the Board of Trustees will manage the financial and business affairs of the Academy, and the Scientific Council will manage and control the scientific activities.

Without doubt real progress has been made since, by their wisdom in the formulation of constructive administrative and scientific policies, these two bodies will insure the well-being of the Academy and add great stimulus to its future as an outstanding institution contributing to the advancement of science.

Thus far, the following four Members have been unanimously elected to the Board of Trustees: Harden F. Taylor, Class of 1960-1961; Gordon Y. Billard, Class of 1960; W. Stuart Thompson, Class of 1960-1962; and Dean Rusk, Class of 1960-1963. These Trustees, together with President Hilary Koprowski and Past-Presidents Ross F. Nigrelli and Boris Pregel, constitute a functioning body of seven Trustees.

The initial meeting of the Board of Trustees was held on November 5, 1959, at which Boris Pregel was unanimously elected Chairman of the Board to serve until January, 1960.

At this first meeting, the Board of Trustees acknowledged its appreciation of the great responsibility that has been delegated to it by the Membership of the Academy, with the realization that the past twenty-five years have seen a period of growth in the Academy that has been unequalled in its entire history of one hundred and forty-three years.

The Academy has just passed through a transition period and has remained strong in its scientific program and financial status. It can now plan boldly with confidence for its future.

Report of the Treasurer

Despite the handicaps of the operating deficit with which the Academy opened the fiscal year just passed, the sharp increase in dues made necessary by inflationary prices, and the many active and often costly demands for its services, the Academy showed a steady improvement in its financial status, ending the year in the strongest financial position it has yet achieved and with an outstanding record of accomplishment.

These facts are evidenced by the continuing requests for holding important conferences, of which 19 were held in 1959; the increased volume of publications resulting therefrom and of the number distributed to the membership; and, as the year advanced, by the Academy's recovery from the opening operating deficit to a firm surplus balance as at October 31, 1959.

The Academy sincerely appreciates the continuing widespread interest of the Membership in maintaining by its support the earnest efforts being made by the Officers and the Staff of the Academy to achieve more and better ways of serving science.

The Membership's sympathetic understanding and support of the increase in dues, together with its recommendation of new Members, held the net loss of Members to 7.6%, so that the income from this source rose to a new peak of $338,639.05.

The report on publications also indicates a record high in those published (9,240 text pages); those distributed (1,610,879 copies, including reprints); and in the volume of sales ($354,269.16).

Operating income from all sources for the entire year was the highest for any one year, totaling $892,868.07, an increase of $182,558.40 above that for 1958 and amounted to $78,188.30 of income above expenses for 1959. Thus, the books of accounting for operations show a surplus of $19,367.66 as of October 31, 1959.

The capital assets of the Endowment and Building Funds were increased by $72,630.11 during 1959. The combined total of these funds was $1,134,636.40 at the close of this fiscal year.

The total gross assets of the Academy, including those of the capital and operating accounts, amounted to $1,269,646.25 on October 31, 1959.

Grants-in-aid and contributions totaling $173,365.78 have been received. These donations to the work of the Academy were given to cover expenses of conferences, traveling expenses of speakers, publication costs, use of the Building, and general operations.

The Academy is deeply grateful for this additional financial aid to its splendid work. It is hoped that the Membership will aid the Academy in obtaining grants-in-aid, contributions, and bequests to further the objectives of this institution.

The Women's Auxiliary of the Academy contributed the sum of $508.10 during 1959. This sum represents the net income from the benefits held last year by these ladies. The Council has expressed its appreciation and that of the Academy by a resolution of thanks to the Women's Auxiliary.

The most significant expenditures were those made for publications, for which the costs totaled $457,363.64, including those for printing, salaries, and expenses of the Editorial, Publications, and Printing Divisions, but not postage and other distribution costs.

Other expenses are normal and within the stated expectations of the results achieved for 1959.

The Academy successfully negotiated the renewal of the mortgage on the Building, the principal of which, after amortization payments during the past ten years, has been reduced from $200,000 to $127,000. By its reassignment as of November 1, 1959, this mortgage will run for eleven and one-half years with the interest rate increased from 4½% to 5½% and the regular payments on principal as heretofore.

The accounts of the Academy have been examined by the auditors, Peat, Marwick, Mitchell & Co. Their report has been approved by the Finance Committee on November 23, 1959, as provided by the Bylaws. These audited financial statements for the year ended October 31, 1959, with comparative figures for the preceding year, appear on the following pages.

Report of the Auditors

PEAT, MARWICK, MITCHELL & Co.
Accountants and Auditors
Seventy Pine Street
New York 5, N. Y.

Accountants' Report

The Finance Committee,
The New York Academy of Sciences:

We have examined the balance sheet of The New York Academy of Sciences as of October 31, 1959 and the related statement of general fund income and expenses and surplus for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

The cash has been confirmed by certificates obtained directly from the depositaries or by count.

We did not confirm the members' dues or the pledges receivable by communication with the respective members or pledgers. No provision has been made for loss on members' dues which may not be paid. We communicated with all debtors on other accounts receivable, representing charges for publications, use of building, etc., by mailing the Academy's statements for the month of October accompanied by a request that we be notified of any exceptions. The exceptions reported were explained to our satisfaction.

The inventory of the printing division is stated in accordance with a physical inventory taken and valued by employees of the Academy and certified by the Executive Director as to description, quantities, condition, and valuation. We made tests of the quantities, prices, and computations. The balance sheet does not reflect the books and publications on hand at October 31, 1959, as it is the policy of the Academy to charge publication costs to expense as incurred.

The marketable securities were inspected or confirmed by the custodian and the income therefrom was confirmed by reference to independent sources.

The real estate at 2 East 63rd Street, New York, was contributed to the Academy in 1949. It is carried in the balance sheet at the valuation, $425,000.00, as assessed by the City of New York for real estate tax purposes as of the date of the contribution, plus the cost of improvements. Furniture, fixtures, and equipment acquired by the Academy, through purchase or contribution, are not reflected in the assets; the purchases during the year ended October 31, 1959 have been charged to the income of the general fund. In conformity with the practice usually followed by similar organizations, the Academy does not provide for depreciation of the building and improvements.

All liabilities of which we obtained knowledge as a result of our examination have received appropriate recognition.

In our opinion, subject to the foregoing comments, the accompanying balance sheet and statement of general fund income and expenses and surplus present fairly the financial position of The New York Academy of Sciences at October 31, 1959 and the results of its operations for the year then ended, on a basis consistent with that of the preceding year.

PEAT, MARWICK, MITCHELL & Co.

New York, N. Y.
November 19, 1959

THE NEW YORK ACADEMY OF SCIENCES
Comparative Balance Sheet

October 31, 1959 and 1958

ASSETS

	1959	1958
General Fund		
Cash in bank and on hand	$ 657.53	1,008.82
Receivables:		
Members' dues	30,787.50	6,275.00
Other accounts	45,773.17	85,061.69
Inventory – printing division	4,817.99	7.778.85
Prepaid expenses	2,008.67	1,430.79
	$ 84,044.86	101,555.15
Endowment Funds		
Cash, deposited with security dealers	$ 771.32	1,667.93
Marketable securities – stated at purchase cost or quoted price at date of contribution (quoted market value at October 31, 1959, $658,204.65)	644,304.70	585,803.34
	$645,076.02	587,471.27
Building Fund		
Cash in bank	$ 318.17	203.23
Receivables – pledges	1,000.00	350.00
Marketable securities – stated at purchase cost or quoted price at date of contribution (quoted market value at October 31, 1959, $34,412.50)	35,961.58	21,701.16
Real estate at 2 East 63rd Street, New York, at assessed valuation at date of contribution, and improvements ($27,280.63) at cost	452,280.63	452,280.63
	$489,560.38	474,535.02
Prize Funds		
Cash in bank	$ 3,799.83	3,717.93
Marketable securities – stated at purchase cost or quoted price at date of contribution (quoted market value at October 31, 1959, $46,736.10)	16,546.79	16,546.79
	$ 20,346.62	20,264.72
Special Funds		
Cash in bank	$ 18,179.16	14,208.67
Receivables – pledges	12,439.21	–
Due from general fund	–	43,149.63
	$ 30,618.37	57,358.30

THE NEW YORK ACADEMY OF SCIENCES

Comparative Balance Sheet

October 31, 1959 and 1958

LIABILITIES AND FUNDS

	1959	*1958*
General Funds		
Liabilities:		
Accounts payable	$ 1,281.20	63,422.13
Mortgage interest accrued, at 4½% per annum	—	1,020.72
Members' dues unearned	60,892.50	39,366.55
Members' dues collected in advance	2,503.50	4,320.00
Due to special funds	—	43,149.63
Fund surplus (deficit) per accompanying statement	19,367.66	(49,723.88)
	$ 84,044.86	101,555.15
Endowment Funds		
Principal of funds:		
John James Audubon Fund	$ 2,500.00	2,500.00
Nathaniel Lord Britton Fund	30,039.77	30,039.77
Centennial Endowment Fund	7,934.00	7,934.00
Roy Waldo Miner Memorial Publication Fund	7,743.00	7,635.00
John Strong Newberry Fund	1,000.00	1,000.00
George H. Sherwood Memorial Fund	7,000.00	7,000.00
Ralph Winfield Tower Memorial Fund	12,728.00	12,728.00
Thomas Lincoln Casey Fund	213,461.99	213,461.99
John Roger Fund	1,000.00	1,000.00
Capital gains and losses (net) on investment transactions, reserved	361,669.26	304,172.51
	$645,076.02	587,471.27
Building Fund		
Mortgage (original amount, $200,000.00) on real estate due November 1, 1959, extended to May 1, 1971 (payable $3,750.00 quarterly for principal and interest at 5½% per annum)	$127,000.00	136,096.76
Principal of fund	362,560.38	338,438.26
	$489,560.38	474,535.02
Prize Funds		
Principal of funds:		
George Frederick Kunz Prize Fund	$ 1,069.60	1,430.39
A. Cressy Morrison Prize Fund	19,277.02	18,834.33
	$ 20,346.62	20,264.72
Special Funds		
Principal of funds:		
Grants-in-aid	$ 29,113.09	56,428.70
Contributions — Women's Auxiliary	1,281.16	773.06
Auditorium project fund	224.12	118.25
Unexpended investment income of endowment funds	—	38.29
	$ 30,618.37	57,358.30

THE NEW YORK ACADEMY OF SCIENCES

Comparative Statement of General Fund Income and Expenses and Surplus
Years Ended October 31, 1959 and 1958

	1959	*1958*
Income:		
Membership dues earned	$338,639.05	232,563.97
Sales of publications	354,269.16	266,090.10
Contributions-in-aid	114,617.61	123,928.98
Contributions – use of building facilities	56,319.21	52,225.94
Contributions to general fund	2,428.96	6,783.28
Income from securities of endowment and building funds	26,594.08	28,717.40
Total Income	$892,868.07	710,309.67
Expenses:		
Publication costs (including salaries and expenses of printing division)	$374,460.06	326,815.08
Distribution of publications	28,918.55	43,145.96
Postage	52,129.12	39,020.41
Mailing salaries and expenses	24,032.44	–
Conference and meeting expenses	88,034.12	126,829.32
Building operating salaries and expenses	44,809.64	38,911.90
Executive salaries and expenses	44,907.38	39,497.55
Editorial staff – salaries and expenses	53,985.03	51,501.15
Membership expansion – salaries and expenses	22,538.37	26,715.08
Public relations – salaries and expenses	8,927.62	11,935.76
Societies administration	17,208.16	13,573.69
Social security taxes	6,342.07	5,061.46
Interest on mortgage	6,158.46	6,303.72
Accounting salaries and expenses	20,162.94	19,241.26
General office salaries and expenses	21,772.61	17,596.59
Prize award expenses	293.20	–
Total Expenses	$814,679.77	766,148.93
Excess of income over expenses for year	78,188.30	–
Excess of expenses over income for year	–	(55,839.26)
General fund surplus (deficit) at beginning of year	(49,723.88)	14,746.92
	28,464.42	(41,092.34)
Deduct contribution from general fund to building fund, equivalent to the payments of mortgage principal	9,096.76	8,631.54
General fund surplus (deficit) at end of year	$ 19,367.66	(49,723.88)

Note: Effective January 1, 1959, as authorized by the Scientific Council of the Academy, the dues for general membership were increased from $15.00 to $25.00 a year.

Report of the Corresponding Secretary

There are, at present, upon the rolls of the Academy, 70 Honorary Life Members. The Corresponding Secretary takes this opportunity of presenting the Members of the Academy with an up-to-date list of the Honorary Life Membership Class.

Sven Olof Asplund ..... Gothenburg, Sweden
William Thomas Astbury ..... Leeds, England
Isaac Berenblum ..... Rehovoth, Israel
Ernst David Bergmann ..... Tel-Aviv, Israel
Charles Herbert Best ..... Toronto, P. Q., Canada
Niels Bohr ..... Copenhagen, Denmark
Henri Breuil ..... Paris, France
MacFarlane Burnet ..... Victoria, Australia
Adolf F. J. Butenandt ..... Munich, Germany
Albert M. Caquot ..... Paris, France
Alfonso Caso ..... Mexico, D. F., Mexico
J. A. Christiansen ..... Copenhagen, Denmark
James Bertram Collip ..... London, Ont., Canada
Arthur H. Compton ..... St. Louis, Missouri
Charles Alfred Coulson ..... Oxford, England
John Cockcroft ..... Cambridge, England
Eduardo Cruz-Coke ..... Santiago, Chile
Henry Dale ..... London, England
Thomas Dalling ..... Rome, Italy
Henrique Da Rocha Lima ..... São Paulo, Brazil
Clinton J. Davisson ..... Charlottesville, Virginia
Peter J. W. Debye ..... Ithaca, New York
Albert Defant ..... Innsbruck, Austria
Ulick R. Evans ..... Cambridge, England
Emanuel Faure-Fremiet ..... Paris, France
Howard Walter Florey ..... Oxford, England
Ross Granville Harrison ..... New Haven, Connecticut
David Kennedy Henderson ..... Edinburgh, Scotland
Corneille J. F. Heymans ..... Ghent, Belgium
Cyril Norman Hinshelwood ..... Oxford, England
Bernardo A. Houssay ..... Buenos Aires, Argentina
Julian S. Huxley ..... London, England
Christopher Kelk Ingold ..... London, England
James Tutin Irving ..... Boston, Massachusetts
Harold Jeffreys ..... Cambridge, England
Peter Kapitza ..... Moscow, U.S.S.R.
Vasant Ramj Khanolkar ..... Bombay, India
Alfred L. Kroeber ..... Berkeley, California
Hugo Rudolph Kruyt ..... The Hague, Holland
André Lwoff ..... Paris, France
Gregorio Posadillo y Maranón ..... Madrid, Spain
Peter Brian Medawar ..... London, England
Alexander N. Nesmeyanov ..... Moscow, U.S.S.R.
Ernst Harald Norinder ..... Uppsala, Sweden
Marcus L. E. Oliphant ..... Canberra A.C.T., Australia
Francis Perrin ..... Paris, France
Jean Piaget ..... Geneva, Switzerland
Henri Pieron ..... Paris, France
A. R. Radcliffe-Brown ..... Grahamstown, South Africa
Gaston Léon Ramon ..... Paris, France
Herbert Harold Read ..... London, England
Robert Robinson ..... Great Missenden, Bucks., England
F. J. W. Roughton ..... Cambridge, England
John A. M. Runnstrom ..... Stockholm, Sweden
Bertrand A. W. Russell ..... Cambridge, England
H. Schaefer ..... Heidelberg, Germany
Gerhard Schramm ..... Tübingen, Germany
Adolph H. Schultz ..... Zurich, Switzerland
Wilson Smith ..... London, England
Erik A. Stensio ..... Stockholm, Sweden

Th. Svedberg ..... Uppsala, Sweden
Nicholas H. Swellengrebel ..... Amsterdam, Holland
Albert Szent-Györgyi ..... Woods Hole, Massachusetts
Arne Tiselius ..... Uppsala, Sweden
Felix A. Vening-Meinesz ..... Anersfoort, Holland
Henri René Villat ..... Paris, France
Robert von Heine-Geldern ..... Vienna, Austria
Max von Laue ..... Berlin-Dahlem, Germany
David M. S. Watson ..... London, England
Hideki Yukawa ..... Kyoto, Japan

Record is made with regret of the death of the following Honorary Life Members:

Niels Bjerrum, Copenhagen, Valby, Denmark, elected 17 December 1947, died 30 September 1958.

Maurice Caullery, Paris, France, elected 21 December 1936, died 13 July 1958.

K. S. Lashley, Orange Park, Florida, elected 21 December 1936, died 1958.

Kaj U. Linderstrom-Lang, Copenhagen, Valby, Denmark, elected 7 December 1949, died 25 May 1959.

Robert H. Lowie, Berkeley, California, elected 14 December 1944, died September 1957.

Report of the Recording Secretary

The results of the past year 1959 have served to strengthen and advance the determination to make steady progress in the expansion program of the Academy.

Without doubt, the revision of the Constitution authorizing the establishment of the Board of Trustees has been the most important action taken by the Academy this year.

The Scientific Council established a new standing committee under the name "Educational Advisory Committee," with the stated duties of "(a) To advise and assist accredited educational groups, upon request, on academic problems pertaining to science education, especially at the secondary level," and "(b) To report to the Council, from time to time, on progress made in the furtherance of science education."

As its first task, and upon the request of Samuel Schenberg, Director, Science Department, Board of Education, New York, N. Y., the Committee organized a group of nineteen well-known biologists into nine teams who visited fourteen of the high schools in New York City (random selection) and made an evaluation study of the biology courses as they are being taught in these schools. The stated aim of this evaluation study was "(1) To assist the newly formed Science Department to present an acceptable up-to-date course of study in biology at the high school level and to make recommendations for modifications of the present course if it is considered that these will effect an improvement," and "(2) To determine whether facilities and equipment are available to permit the implementation of such an up-to-date course in biology and to make recommendations for supplementing existing facilities and equipment where considered necessary."

The individual reports prepared by these scientists have been consolidated into a single report, of which 150 copies have been printed and submitted to Mr. Schenberg for the consideration of the Superintendent of Schools and of the Board of Superintendents of New York's schools.

Similar studies and reports concerning the methods of teaching chemistry, physics, mathematics, and other allied subjects have been prepared for this project by committees of scientists representing other societies.

In addition to the 19 conferences listed below, 496 meetings were held in the Academy Building during 1959. These include the total of 160 meetings of the Sections and Divisions, committee and Council meetings, and luncheon and dinner meetings of the Academy. The remainder covers the meetings of the 59 other Societies to which the accommodations of the Building were extended.

The following list of nineteen conferences held during the fiscal year, November 1, 1958 to October 31, 1959, indicates by the fields represented that the Academy's interests in advancing research through its meeting and publication activities are being extended into all fields of science:

"The Cytopathology of Virus Infection," Chairman, Robert Love, November 7 and 8, 1958, Section of Biology.

"Hypothermia," Chairman, A. Cecil Taylor, November 13 and 14, 1958, Section of Biology.

"Radiation and High Temperature Behavior of Textiles," Chairman, J. J. Press, November 14 and 15, 1958, Section of Physics and Chemistry. Under the joint auspices of The New York Academy of Sciences, The Polytechnic Institute of Brooklyn, and the U.S. Navy Clothing and Textile Research Laboratory.

"Amine Oxidase Inhibitors," Chairman, D. Wayne Woolley, November 20, 21, and 22, 1958, Section of Biology. Under the joint auspices of The New York Academy of Sciences, Hoffmann-La Roche Inc., Lakeside Laboratories, Inc., and Warner-Lambert Research Institute.

"Modern Aspects of the Geology of New York City and Environs," Chairman, Kurt E. Lowe, December 6, 1958, Section of Geology and Mineralogy.

"A Decade of Anti-Inflammatory Steroids, from Cortisone to Dexamethasone," Chairman, Joseph J. Bunim, December 15 and 16, 1958, Section of Biology. Under the joint auspices of The New York Academy of Sciences, Merck Sharp & Dohme Research Laboratories, and the Schering Corporation.

"Genetics of *Streptomyces* and Other Antibiotic-producing Microorganisms," Chairman, Waclaw Szybalski, January 6, 1959, Division of Mycology.

"Biology of the Pleuropneumonialike Organisms," Chairman, D. G. ff. Edward, January 14, 15, and 16, 1959, Section of Biological and Medical Sciences.

"Hair Growth and Hair Regeneration," Chairman, Irwin L. Lubowe, January 31, 1959, Section of Biological and Medical Sciences.

"Inactivation of Viruses," Co-Chairmen, Ernest C. Pollard and A. R. Taylor, March 19 and 20, 1959, Section of Biological and Medical Sciences.

"The Vagina," Chairman, Warren R. Lang, April 10 and 11, 1959, Section of Biological and Medical Sciences.

"Current Trends in Research and Clinical Management of Diabetes," Chairman, Peter H. Forsham, April 10 and 11, 1959, Section of Biological and Medical Sciences. Held under the joint auspices of The New York Academy of Sciences, The Upjohn Company, and Farbwerke-Hoechst AG.

"Molten Salts," Chairman, Benson R. Sundheim, April 13, 14, and 15, 1959, Section of Biological and Medical Sciences.

"Recent Contributions to Antibacterial Therapy," Organizing Chairman, Emanuel Grunberg, May 21 and 22, 1959, Section of Biological and Medical Sciences.

"Social and Cultural Pluralism in the Caribbean," Co-Chairmen, Vera Rubin and Dorothy L. Keur, May 27 and 28, 1959, Division of Anthropology. Held under the joint auspices of The New York Academy of Sciences and the Research Institute for the Study of Man.

"Molecular Organization in Solid High Polymers," Chairman, F. R. Eirich, June 20, 1959, Section of Chemical Sciences. Held under the joint auspices of The New York Academy of Sciences and The Polytechnic Institute of Brooklyn.

"Freezing and Drying of Biological Materials," Chairman, H. T. Meryman, October 1 and 2, 1959, Section of Biological and Medical Sciences.

"Numerical Properties of Functions of More Than One Independent Variable," Chairman, Henry C. Thacher, Jr., October 8, 9, and 10, 1959, Division of Mathematics.

"The Metabolism of Oral Tissues," Chairman, Philip Person, October 15, 16, and 17, 1959, Section of Biological and Medical Sciences.

The Academy extends its cordial expression of thanks and deep appreciation to those scientists who participated in these programs and have so generously given of the results of their research and knowledge and of their time to advance the work in these fields and to aid the Academy in its progress.

During the year ending October 31, 1959, 1,360 new Members were added to the rolls as follows: 7 Honorary Life Members; 15 Active Life Members; 21 Sustaining Members; 1,262 Annual Active Members; 55 Student Members. Forty-six former Members were reinstated, thus making a total of 1,406 names added to the current Membership rolls. Two hundred and ninety transfers were effected in the Annual classes and 2 Sustaining Members, 15 Annual Active Members, and 1 Reinstated Annual Active Member transferred to Active Life Membership.

The Academy lost by death 5 Honorary Life Members, 2 Active Life Members, 4 Sustaining Members, and 52 Annual Active Members. Two thousand one hundred and ninety-five resignations were accepted and 358 members were dropped as not having paid dues or for not having qualified for Membership.

The Academy now stands with a net loss of 1,247 Members for the current year. There are at present upon the rolls of the Academy 14,770 Members of whom 1,315 are Fellows, classified as follows:

1 Gold Card Member	430 Active Life Members
3 Benefactors	285 Sustaining Members
2 Patrons	13,785 Annual Active Members
70 Honorary Life Members	186 Student Members

8 Corporation Members

Record is made with regret of the loss by death of the following Members:

Active Life Members

Bertram T. Butler, elected to Active Membership 2 February 1931; Sustaining Member until January 1941; transferred to Active Membership 1 January 1940; transferred to Life Membership 1957. Died January 1959. Fellow.

Manfred Sakel, elected to Life Membership, 27 May 1955. Died 2 December 1958.

Sustaining Members

Robert Chobot, elected to Sustaining Membership 23 October 1947. Died October 1958.

Cheney Cleveland Joseph, elected to Sustaining Membership 26 January 1956. Died October 1958.

I. C. Rubin, elected to Sustaining Membership 25 May 1950. Died July 1958.

Druska Carr Schaible, elected to Sustaining Membership 24 January 1957. Died November 1957.

Active Members

Glen H. Algire, elected to Active Membership 14 June 1946. Died January 1959. Fellow.

Lale C. Andrews, elected to Active Membership 23 September 1954. Died August 1958.

Isidore Arons, elected to Active Membership 22 April 1948. Died November 1958.

Raymond M. Barenco, Sr., elected to Active Membership 17 May 1954. Died July 1959.

Leo Berman, elected to Active Membership 16 August 1954. Died 27 December 1958.

Frank H. Bethell, elected to Active Membership 23 April 1959. Died April 1959.

James H. Black, elected to Associate Membership 18 July 1939; transferred to Active Membership 22 January 1948. Died 30 November 1958.

Alexander W. Blain, elected to Active Membership 6 March 1939. Died December 1958. Fellow.

Rawley E. Chambers, elected to Active Membership 23 October 1958. Died 14 November 1958.

Edmund Wei-Kuang Cheng, elected to Active Membership 22 March 1956. Died October 1958.

Robert H. Clifford, elected to Active Membership 27 March 1958. Died 15 May 1959.

William M. Coppridge, elected to Active Membership 30 June 1954. Died August 1959.

Leland G. Cox, elected to Active Membership 15 May 1957. Died 2 April 1959.

Hugo Darling, elected to Active Membership 1 December 1941. Died October 1958.

Frederick I. Dessau, elected to Active Membership 16 August 1948. Died 23 February 1959.

Jack King Finnegan, elected to Active Membership 25 January 1951. Died 13 September 1958.

A. Hastings Fiske, elected to Active Membership 13 July 1951. Died August 1959.

Nathan C. Foot, elected to Active Membership 15 September 1949. Died September 1958. Fellow.

James W. Gaffey, elected to Active Membership 26 April 1956. Died 2 November 1958.

Lincoln Godfrey, elected to Active Membership 23 February 1956. Died 18 December 1958.

Jesse Greenwald, elected to Active Membership 25 February 1954. Died 4 August 1958.

Eric P. Hausner, elected to Active Membership 27 January 1955. Died 2 July 1959.

Selian Hebald, elected to Active Membership 26 January 1956. Died May 1959.

Herbert G. Johnstone, elected to Active Membership 16 November 1950. Died 5 December 1958.

Stockton Kimball, elected to Active Membership 25 March 1954. Died December 1958.

Arthur Kirschbaum, elected to Active Membership 20 September 1956. Died 8 May 1958. Fellow.

Armstead M. Klein, elected to Active Membership 23 October 1958. Died November 1958.

Alfred Knight, elected to Associate Membership 18 June 1940; transferred to Active Membership 15 July 1948. Died November 1958.

William Latimer Small Landes, elected to Active Membership 23 October 1958. Died 21 December 1958.

Philip R. Lehrman, elected to Active Membership 7 April 1941. Died January 1959.

Elise S. L'Esperance, elected to Active Membership 15 September 1949. Died July 1959. Fellow.

Samuel C. Miller, elected to Active Membership 27 October 1949. Died 8 February 1959. Fellow.

Rollen Wayne Moody, elected to Active Membership 24 April 1958. Died May 1959.

E. Miner Morrill, elected to Active Membership 22 May 1958. Died December 1958.

I. William Nachlas, elected to Active Membership 20 June 1957. Died April 1958.

Carl S. Nadler, Jr., elected to Active Membership 26 January 1956. Died 5 February 1959.

John Treadwell Nichols, elected to Active Membership 1 November 1920. Died 10 November 1958.

Thomas B. Noble, elected to Active Membership 23 February 1956. Died 8 December 1958.

C. Leonard O'Connell, elected to Active Membership 28 February 1957. Died 1 September 1958.

James W. Papez, elected to Active Membership 15 July 1952. Died April 1959.

John B. Reeside, Jr., elected to Active Membership 6 March 1939. Died 2 July 1953. Fellow.

Cornelius P. Rhoads, elected to Sustaining Membership 16 August 1958; transferred to Active Membership 22 January 1959. Died 13 August 1959. Fellow. Council from 1955 to 1957. Vice-President from 1957 to date of death.

Ellis J. Robinson, elected to Active Membership 26 February 1942. Died 5 October 1958.

Gottwald Schwarz, elected to Active Membership 28 April 1955. Died 26 February 1959.

Philip Shapiro, elected to Active Membership 15 September 1952. Died 20 October 1958.

Joseph Stambul, elected to Active Membership 20 December 1955. Died July 1959.

Max Sherover, elected to Active Membership 25 May 1950. Died July 1959.

Marvin Omar Shrader, elected to Active Membership 11 December 1947. Died 21 September 1958.

Daniel Stats, elected to Active Membership 23 January 1947. Died October 1958.

Edward A. Strecker, elected to Active Membership 20 December 1956. Died March 1959.

Matthew Taubenhaus, elected to Active Membership 22 January 1953. Died January 1958.

John B. Watson, elected to Active Membership 6 November 1939. Died 25 September 1958.

Report of the Publications Committee on the Status of Publications

During the fiscal year ending October 31, 1959, The New York Academy of Sciences has published 38 monographs in the *Annals*, comprising a total of 8,514 pages. Included in these are 712 papers by 1,239 authors. The pagination of the *Transactions* (726) brings the total pagination issued to 9,240 pages.

The list of publications issued during the fiscal year is as follows:

Annals

Volume 73, Article 5, *Psoriasis* (11 papers) by Peter Fiesch *et al.* Pages 911-1037. Published November 10, 1958.

Volume 74, Article 2, *Photoreception* (21 papers) by Jerome J. Wolken *et al.* Pages 161-406. Published November 12, 1958.

Volume 72, Article 11. *Rational Simplifications for the Buckling Length of Columns* (1 paper) by Thomas C. Kavanagh. Pages 353-386. Published November 18, 1958.

Volume 76, Article 3. *Screening Procedures for Experimental Cancer Chemotherapy* (55 papers) by C. Chester Stock *et al.* Pages 409-970. Published December 5, 1958.

Volume 75, Article 2. *The Uterus* (48 papers) by Joseph T. Velardo, William B. Ober, and Herbert G. Winston *et al.* Pages 385-1040. Published January 9, 1959.

Volume 77, Article 1. *The Organization of The New York Academy of Sciences: Its Incorporation, Its Amended Charter, Its Constitution and Bylaws.* Revised to November 20, 1958. (1 paper) Emerson Day, Recording Secretary. Pages 1-24. Published January 10, 1959.

Volume 76, Article 4. *Conceptual and Methodological Problems in Psychoanalysis* (6 papers) by Leopold Bellak *et al.* Pages 971-1134. Published January 23, 1959.

Volume 72, Article 12. *Metabolic Factors in Cardiac Contractility* (17 papers) by Menard M. Gertler and G. W. E. Plaut *et al.* Pages 387-558. Published February 6, 1959.

Volume 79, Article 1. *Quantum Aspects of Catalysis: The Drying of Linseed Oil* (1 paper) by Raymond R. Myers. Pages 1-8. Published March 9, 1959.

Volume 72, Article 13. *The Analysis of Mixtures of Volatile Substances* (20 papers) by Emil F. Williams *et al.* Pages 559-785. Published March 20, 1959.

Volume 74, Article 3. *Chlorpropamide and Diabetes Mellitus* (71 papers) by Martin G. Goldner *et al.* Pages 407-1028. Published March 30, 1959.

Volume 78, Article 1. *Germfree Vertebrates: Present Status* (30 papers) by James A. Reyniers *et al.* Pages 1-400. Published May 8, 1959.

Volume 77, Article 2. *Axenic Culture of Invertebrate Metazoa: A Goal* (25 papers) by Ellsworth C. Dougherty *et al.* Pages 25-406. Published May 26, 1959.

Volume 72, Article 14. *The Influence of Hormones on Lipid Metabolism in Relation to Arteriosclerosis* (18 papers) by Abraham Dury and Carleton R. Treadwell *et al.* Pages 787-1054. Published June 16, 1959.

Volume 78, Article 2. *The Biology of the Amoeba* (22 papers) by Henry I. Hirshfield *et al.* Pages 787-1054. Published June 16, 1959.

Volume 77, Article 3. *Hematopoietic Mechanisms* (27 papers) by Albert S. Gordon and Walter S. Root, *et al.* Pages 407-820. Published June 25, 1959.

Volume 79, Article 2. *Studies on Marine Bryozoa.* XI: Antarctic Osthimosiae (1 paper) by Mary D. Rogick. Pages 9-42. Published June 30, 1959.

Volume 78, Article 3. *Radiopaque Diagnostic Agents* (26 papers) by Maxwell H. Poppel *et al.* Pages 705-1020. Published July 2, 1959.

Volume 81, Article 1. *The Cytopathology of Virus Infection* (22 papers) by Robert Love *et al.* Pages 1-214. Published July 21, 1959.

Volume 80, Article 1. *Trophoblast and Its Tumors* (16 papers) by William B. Ober *et al.* Pages 1-284. Published August 28, 1959.

Volume 81, Article 2. *Second Conference on Physicochemical Mechanism of Nerve Activity and Second Conference on Muscular Contraction* (22 papers) by David A. Nachmansohn and Alexander Sandow *et al.* Pages 215-510. Published August 28, 1959.

Volume 79, Article 3. *Psychophysiological Reactions to Novel Stimuli: Measurements, Adaptation, and Relationship of Psychological and Physiological Variables in the Normal Human* (1 paper) by Roscoe A. Dykman *et al.* Pages 43-107. Published August 31. 1959.

Volume 82, Article 1. *Recent Contributions to Antibacterial Therapy* (29 papers) by Paul S. Rhoads *et al.* Pages 1-190. Published September 1, 1959.

Volume 81, Article 3. *Enzymes of Polynucleotide Metabolism* (29 papers) by Jay S. Roth *et al.* Pages 511-804. Published September 4, 1959.

Volume 80, Article 2. *Hypothermia* (26 papers) by A. Cecil Taylor *et al.* Pages 285-550. Published September 14, 1959.

Volume 79, Article 5. *On the Design of Structural Models to Study the Thermal Stress Phenomenon* (1 paper) by I. Albert Scipio II. Pages 143-156. Published September 16, 1959.

Volume 79, Article 4. *Modes and Natural Frequencies of Suspension-Bridge Oscillations* (1 paper) by D. B. Steinman. Pages 109-142. Published September 16, 1959.

Volume 80, Article 3. *Amine Oxidase Inhibitors* (46 papers) by D. Wayne Woolley *et al.* Pages 551-1045. Published September 17, 1959.

Volume 80, Article 4. *Modern Aspects of the Geology of New York City and Environs* (9 papers) by Kurt E. Lowe *et al.* Pages 1047-1170. Published September 21, 1959.

Volume 82, Article 2. *Current Trends in Research and Clinical Management of Diabetes* (45 papers) by Peter H. Forsham *et al.* Pages 191-644. Published September 25, 1959.

Volume 81, Article 4. *Genetics of Streptomyces and Other Antibiotic-Producing Microorganisms* (16 papers) by Waclaw Szybalski *et al.* Pages 805-1016. Published September 30, 1959.

Volume 82, Article 3. *Radiation and High-Temperature Behavior of Textiles* (14 papers) by J. J. Press *et al.* Pages 645-796. Published October 7, 1959.

Volume 82, Article 4. *A Decade of Anti-Inflammatory Steroids, From Cortisone to Dexamethasone* (25 papers) by Joseph J. Bunim, Frederick K. Heath, and Edward Henderson *et al.* Pages 797-1014. Published October 14, 1959.

Volume 79, Article 6. *Evaluation of Optical Methods in Biomedical Research* (1 paper) by Raymond Jonnard. Pages 157-185. Published October 16, 1959.

Volume 79, Article 7. *Electron Group Polarizability and Molecular Properties of Organophosphorus Compounds* (1 paper) by Henry Tolkmith. Pages 187-232. Published October 26, 1959.

Volume 79, Article 8. *Approximate Analysis of Nonuniform Rectangular Plates Supported at Nonequidistant Isolated Points* (1 paper) by L. Albert Scipio II. Pages 233-256. Published October 28, 1959.

Volume 83, Article 1. *Molecular Organization in Solid High Polymers* (5 papers) by Frederick R. Eirich *et al.* Pages 1-76. Published October 31, 1959.

Volume 79, Article 9. *The Primary Mental Abilities of Chinese Students: A Comparative Study of the Stability of a Factor Structure* (1 paper) by Steven G. Vandenberg. Pages 257-304. Published October 31, 1959.

In addition to the publications cited above, the following monographs were published in the *Annals* during November 1959, after the close of the fiscal year:

Volume 83, Article 2. *The Vagina* (25 papers) by Warren R. Lang *et al.* Pages 77-358. Published November 18, 1959.

Volume 83, Article 3. *Hair Growth and Hair Regeneration* (15 papers) by Irwin I. Lubowe *et al.* Pages 359-512. Published November 20, 1959.

The number of pages of the two monographs listed above totals 434. This figure will be included in the pagination for the fiscal year 1959-1960.

Transactions

Series II, Volume 21, Numbers 1 to 8, consisting of 726 pages, covering the period from November 1958 to June 1959, inclusive, was completed, printed, and distributed during the calendar year.

Annals in Press

The Correlation of Hinged Four-Bar Straight-Line Motion Devices by Means of the Roberts Theorem and a New Proof of the Latter (1 paper) by A. E. Richard de Jonge. In page proof.

Biology of the Pleuropneumonialike Organisms (54 papers) by D. G. ff. Edward *et al.* In page proof.

Social and Cultural Pluralism in the Caribbean (14 papers) by Vera Rubin *et al.* In page proof.

Inactivation of Viruses (20 papers) by Ernest C. Pollard *et al.* In page proof.

Bioengineering Problems in Early Manned Space Flight (1 paper) by Richard W. Lawton *et al.* In page proof.

Molten Salts (24 papers) by Benson R. Sundheim *et al.* In galley proof.

Scientific Survey of Porto Rico and the Virgin Islands

Volume XVII, Part 2. *Digenetic Trematodes of Puerto Rican Shore Birds* (1 paper) by Raymond M. Cable *et al.* In galley proof.

From November 1, 1958 to October 31, 1959, the Academy distributed 1,610,879 separate publications, including reprints, of the various series as follows:

Distribution of Publications
11/1/58 to 10/31/59

	Separate Numbers
Annals	
Members	165,856
Gratis: Authors, reviews, exchanges and donors	34,748
Sales	89,123
Authors' reprints	1,053,200

Transactions	
Members	119,275
Gratis: Authors, exchanges, reviews	5,403
Sales	2,681
Authors' reprints	13,300
Special Publications, Volume I, III, IV, V	
Sales	441
Scientific Survey of Porto Rico and the Virgin Islands	
Sales	1,038
Monthly Program	
Members	124,413
Sales	350
Gratis: Individuals	1,051
	1,610,879

In addition to sales, the total *list* value of those publications distributed to the members, and gratis to authors, donors, reviews and exchange institutions is $512,331.75.

Election of Fellows and Honorary Life Members

The following Members were elected to Fellowship:

Abajian, John, Jr., M.D.
Ajl, Samuel Jacob, Ph.D.
Asper, Samuel Phillips, Jr., M.D.
Aviado, Domingo M., Jr., M.D.
Atwood, Kimball C., M.D.
Baldwin, Maitland, M.D.
Barker, Harold Grant, M.D.
Barski, Georges, Sc.D.
Bassett, C. Andrew L., M.D.
Becker, David V., M.D.
Behrens, Otto Karl, Ph.D.
Beinfield, William H., M.D.
Beloff, Ruth H., Ph.D.
Berger, Frank M., M.D.
Berkley, Carl
Bircher, Rudolf, M.D.
Bishop, Hazel, B.A.
Blaskovic, Dionyz, M.D.
Bodian, David, M.D.
Bonfiglio, Michael, M.D.
Bostrom, Roland C., B.S.
Bovarnick, Max, M.D.
Boyd, Theodore E., Ph.D.
Brewster, William Russell, Jr., M.D.
Brown, Ellis V., Ph.D.
Brown, William F., Jr., Ph.D.
Bruni, Carlo, M.D.
Bryson, Vernon, Ph.D.
Bugher, John C., M.D.
Casals-Ariet, Jordi, M.D.
Challice, Cyril Eugene, Ph.D.
Chinard, Francis P., M.D.
Cohen, Sylvan Irving, Ph.D.
Cotton, John M., M.D.
Daly, Marie M., Ph.D.
Deschiens, Maurice V. P., Ph.D.
Lusted, Lee B., M.D.
McLimans, William F., Ph.D.
Makower, Henryk, M.D.
Malone, Thomas Francis, Sc.D.
Mandel, Benjamin, Ph.D.
Max, Louis W., Ph.D.
Mazia, Daniel, Ph.D.
Melton, Arthur W., Ph.D.
Micka, Jan, D.Sc.
Miller, Lawrence P., Ph.D.
Mills, Jack, Ph.D.
Mitchell, Herschel K., Ph.D.
Morton, Avery A., Ph.D.
Moscona, Aron A., Ph.D.
Mosher, William Allison, Ph.D.
Murphy, James S., M.D.
Murphy, Leslie C., D.V.M.
Nace, Harold R., Ph.D.
Nelson, Carl Truman, M.D.
Nemes, Marjorie M., M.D.
Newcomer, H. Sidney, M.D.
Niemann, Carl, Ph.D.
Ober, Frank R., M.D.
Ocfemia, Gerardo O., Ph.D.
Oginsky, Evelyn L., Ph.D.
O'Kane, Daniel J., Jr., Ph.D.
Orkin, Louis R., M.D.
Papazian, Haig Page, Ph.D.
Pappas, George S., Ph.D.
Perkins, John Forbes, Jr., M.D.
Pfister, Karl, III, Ph.D.
Pierce, Cynthia H., Ph.D.
Pullman, Ira, Ph.D.
Ramsey, Norman F., Ph.D.
Rand, James H., III
Rashevsky, Nicolas, Ph.D.

Donovan, Maurice Anthony, M.D.
Dulaney, Eugene L., Ph.D.
Eckert, Ernest R. G., Dr. Ing.
Eisenmenger, William J., M.D.
Elderfield, Robert C., Ph.D.
Ellingson, Rudolph C., Ph.D.
Feigen, George Alexander, Ph.D.
Ferrari, Andres Jr.
Finlay, Alexander, M.S.
Flagg, Paluel J., M.D.
Flynn, John E., Ph.D.
Gold, Edwin Martin, M.D.
Gots, Joseph S., Ph.D.
Graham, A.F., Ph.D.
Grant, Ronald, Ph.D.
Greene, Nicholas M., M.D.
Greig, Margaret E., Ph.D.
Grief, Roger L., M.D.
Gusberg, Saul Bernard, M.D.
Haase, Walter, Dr. Eng.
Haenseler, Conrad M., Ph.D.
Hammon, William McD., M.D.
Handler, Philip, Ph.D.
Hartung, Ernest W., Ph.D.
Hartung, Walter H., Ph.D.
Hausmann, Werner, D.Sc.
Hazen, Elizabeth L., Ph.D.
Herrick, Julia F., Ph.D.
Herstein, Karl M., B.S.
Hisaw, Frederick L., Ph.D.
Hitchcock, Charles B., M.A.
Hobson, Lawrence B., Ph.D.
Holaday, Horace A., B.A.
Honig, Pieter, M.D.
Horvath, Steven M., Ph.D.
Jesaitis, Margeris A., Sc.D.
Johnson, John R., Ph.D.
Jones, Reuben G., Ph.D.
Jones, Richard E., B.E.E.
Kamijo, Kazuya, M.D.
Kavanagh, Frederick, Ph.D.
Keats, Arthur S., M.D.
Kendall, Edward C., Ph.D.
Kinzel, Augustus Braun, D.Sc.
Kirk, Paul L., Ph.D.
Klein, Morton, Ph.D.
Kline, Nathan S., M.D.
Knoppers, Antonie T., M.D.
Knox, W. Eugene, M.D.
Kumm, Henry William, M.D.
Laughlin, John S., Ph.D.
Lavine, Leroy S., M.D.
Lepkovsky, Samuel, Ph.D.
Lilly, John C., M.D.
Little, David M., Jr., M.D.
Lowe, Kurt E., Ph.D.
Rasmussen, Theodore Brown, M.D.
Razran, Gregory, Ph.D.
Rees, Mina, Ph.D.
Riegel, Byron, Ph.D.
Riesen, Austin H., Ph.D.
Roberts, Eugene, Ph.D.
Robins, Eli, M.D.
Rosenfeld, John L., Ph.D.
Rubin, Vera, Ph.D.
Salomon, Kurt, M.D.
Schabel, Frank M., Jr., Ph.D.
Schlesinger, Edward B., M.D.
Schmitt, Otto H., Ph.D.
Schweigert, Bernard S., Ph.D.
Schwerdt, Carlton E., Ph.D.
Scott, Charles C., Ph.D.
Seaborg, Glenn Theodore, Ph.D.
Searle, Donald S., M.D.
Severinghaus, John W., M.D.
Shabica, C. A., Ph.D.
Sheffner, Leonard, Ph.D.
Shepard, Richard Blount, M.D.
Shepard, Richard Hance, M.D.
Shubick, Philippe, Ph.D.
Shumway, George A., Jr., Ph.D.
Shurrager, Phil Sheridan, Ph.D.
Siegel, Irving H., Ph.D.
Skipper, Howard E., M.D.
Smith, Lloyd P., Ph.D.
Snieszko, Stanislas F., Ph.D.
Souders, Mott, Jr., Ph.D.
Southwick, Philip L., Ph.D.
Stadtman, Earl R., Ph.D.
Stephen, C. Ronald, M.D.
Stone, Martin L., M.D.
Suckling, Eustace Edgar, D.E.E.
Sulzberger, Arthur Hays, LL.D.
Suter, Emanuel, M.D.
Tager, Morris, M.D.
Talbot, T. R., Jr., M.D.
Taliaferro, W. H., Ph.D.
Tatum, E. L., Ph.D.
Taylor, A. Cecil, Ph.D.
Taylor, Dermot B., M.B.
Thesleff, Stephen, M.D.
Tobias, Julian M., Ph.D.
Toolan, Helene Wallace, Ph.D.
Utter, Merton F., Ph.D.
Vallee, Bert L., M.D.
Vishniac, Roman, Ph.D.
von Sallmann, Ludwig, M.D.
Wechsler, David, Ph.D.
Wilson, Katherine S., Ph.D.
Wood, John R., Sc.D.
Zinsser, Hans H., M.D.
Zintel, Harold A., M.D.

Honorary Life Memberships were conferred upon the following eminent scientists:

Frederick Charles Bawden, Rothamsted Experimental Station, Harpenden, Herts., England.

Ivane Beritashvili (J. Beritoff), Institute of Physiology Beritashvili, Tbilisi, Union of Soviet Socialist Republics.

Adriano A. Buzzati-Traverso, Istituto di Genetica, Universita di Pavia, Pavia, Italy.
Richard Kuhn, University of Heidelberg, Heidelberg, Germany.
Johan Albert Levan, Institute of Genetics, Lund University, Lund, Sweden.
Charles Oberling, College of France, Paris, France.
Tadeus Reichstein, University of Basle, Basle, Switzerland.
Waclaw Sierpinski, Editor in Chief, *Acta Arithmetica*, Warsaw, Poland.
A. A. Smorodintsev, Institute of Experimental Medicine, Leningrad, Union of Soviet Socialist Republics.
Hugo Theorell, Biochemistry Department, Nobel Institute, Stockholm, Sweden.
Sir Alexander R. Todd, Cambridge University, Cambridge, England.
E. Vassy, University of Paris, Paris, France.
G. H. R. von Koenigswald, University of Utrecht, Utrecht, The Netherlands.

Election of Officers

Report of the Tellers

The tellers appointed by President Koprowski to count the ballots for the election of Officers and other Members of the Council and for the election of Officers of the Sections and Divisions to serve for the year 1960 report herewith that the names on the Official Ballot, as printed and distributed, were elected by the votes of the 2,880 valid ballots returned by the Membership.

The list thus chosen by the Membership of the Academy for the year 1960 is as follows:

President-Elect
FREDERICK Y. WISELOGLE

Vice-Presidents
EMERSON DAY — THEODORE SHEDLOVSKY

Recording Secretary
KARL MARAMOROSCH

Corresponding Secretary
CHARLES W. MUSHETT

Councilors (1960-1962)
JOHN JOSEPH LYNCH, S. J. — MORRIS SCHAEFFER

Chairmen and Vice-Chairmen of the Sections and Divisions

SECTION OF BIOLOGICAL AND MEDICAL SCIENCES
Robert L. Kroc, *Chairman* — Charles Noback, *Vice-Chairman*

Division of Anthropology
Dorothy L. Keur, *Chairman* — Ethel Boissevain Lesser, *Vice-Chairman*

Division of Instrumentation
Andres Ferrari, *Chairman* — Walter E. Tolles, *Vice-Chairman*

Division of Mycology
Karl Maramorosch, *Chairman* — Emanuel Grunberg, *Vice-Chairman*

Division of Psychology
Gregory Razran, *Chairman* — Louis W. Max, *Vice-Chairman*

SECTION OF CHEMICAL SCIENCES

Frederick R. Eirich, *Chairman* — Everett S. Wallis, *Vice-Chairman*

Division of Biochemistry

James Boyd Allison, *Chairman* — Raymond L. Garner, *Vice-Chairman*

SECTION OF GEOLOGICAL SCIENCES

R. W. Fairbridge, *Chairman*

Division of Oceanography and Meteorology

Charles Knudsen, *Chairman* — James K. McGuire, *Vice-Chairman*

Division of Engineering

Jacob Feld, *Chairman* — Joseph F. Skelly, *Vice-Chairman*

Awards for 1959

(1) *The A. Cressy Morrison Awards in Natural Science.* After careful consideration and comparison of the twelve eligible papers presented this year, the Committee unanimously voted the following awards:

An award of $400 and citation to the paper entitled *A Petrologic Investigation of the Manlius and Coeymans Limestones,* by Franklin W. Fessenden, College of St. Thomas, St. Paul, Minnesota.

An award of $400 and citation to the paper entitled *Diffusion Behavior of Supersaturated Binary Solutions,* by Jacob Mazur and Turner Alfrey, Jr., Polymer Research Laboratory, The Dow Chemical Company, Midland, Michigan.

No papers were received for the following awards announced for 1959:

(2) *The Boris Pregel Award in the Field of Natural Radioactive Substances.*

(3) *The D. B. Steinman Award for Research in Structural Engineering.*

(4) *The Consumers Union Award in Consumer Research.*

Abstracts of 1959 Award Papers

A PETROLOGIC INVESTIGATION OF THE MANLIUS AND COEYMANS LIMESTONES

Franklin W. Fessenden*

Accorded an A. Cressy Morrison Award in Natural Science, 1959

A petrologic investigation consisting of thin-section and heavy-mineral slide analyses of ninety-four samples taken across the contact of the Manlius and Coeymans formations leads to the conclusion that the contact is transitional. Continuous deposition is inferred for late Silurian through early Devonian time in the Helderberg area. A concentration of large barite grains in an horizon immediately below the waterlime beds which might, upon further study, yield more information about the nature of the transition zone, was observed.

*The Rice Institute, Houston, Texas. *Present address:* College of St. Thomas, St. Paul, Minn.

DIFFUSION BEHAVIOR OF SUPERSATURATED BINARY SOLUTIONS

Jacob Mazur and Turner Alfrey, Jr.†

Accorded an A. Cressy Morrison Award in Natural Science, 1959

The model chosen for the study of diffusion behavior of binary solutions consists of a regular lattice of sites in two dimensions, in which each site is occupied by either Molecule *A* or Molecule *B*. Both molecules are spherical, with identical diameters but different compositions. There is a potential energy of interaction between nearest neighbor pairs. On the basis of this model, two problems were solved:

(1) An equation for the diffusion coefficient as a function of concentration was derived. For this purpose, we assumed the existence of a one-dimensional concentration gradient. The results obtained were compared with the existing thermodynamic and kinetic models.

(2) Two different concentrations are in contact. A general equation for the flux of the material across the boundary was derived. This equation permitted us to examine the conditions for coexistence of two concentrations from the calculated conditions for zero net flux across the boundary. The conditions under which two concentrations can exist for a long time in the form of a metastable solution were determined.

THE NEW YORK ACADEMY OF SCIENCES

announces

THREE SCIENTIFIC AWARDS FOR 1960

The New York Academy of Sciences announces the following three awards for the coming year.

I. THE A. CRESSY MORRISON AWARDS IN NATURAL SCIENCE

Two awards of $400 each, to be known as THE A. CRESSY MORRISON AWARDS IN NATURAL SCIENCE, will be announced at the Annual Meeting of The New York Academy of Sciences in December 1960 for the two most acceptable papers in a field of science covered by the Academy or an Affiliated Society.

II. THE BORIS PREGEL AWARD IN THE FIELD OF NUCLEAR PHYSICS AND NUCLEAR ENGINEERING

Through the generosity of Dr. Boris Pregel, an award of $500 is offered for the most acceptable paper embodying the results of research in the field of nuclear physics and nuclear engineering received during the year 1960. Announcement of this award will be made at the Annual Meeting of the Academy in December 1960.

†Polymer Research Laboratory, The Dow Chemical Company, Midland, Mich.

III. THE D. B. STEINMAN AWARD FOR RESEARCH IN STRUCTURAL ENGINEERING

Through the generosity of Dr. D. B. Steinman, an award of $500 is offered for the most acceptable original paper submitted from the Membership of the Academy in the field of pure or applied research in structural engineering, or in the related science of aerodynamics, or as applied to the analysis and design of civil engineering structures. The purpose is to encourage research, development, and writing in the subject of engineering sciences. This award will be announced at the Annual Meeting of the Academy in December 1960.

CONDITIONS GOVERNING THESE AWARDS.

(1) *Eligibility.* Authors and co-authors applying for awards I and III shall be members in good standing of The New York Academy of Sciences or one of its Affiliated Societies, but nonmembers may become eligible by joining one of these organizations before the closing date.

All scientists engaged in research in the field of nuclear physics and nuclear engineering may make application for award II.

(2) *Date.* Papers are to be submitted on or before October 15, 1960 to the Executive Director of The New York Academy of Sciences, 2 East Sixty-third Street, New York 21, N. Y.

(3) *Papers.* All papers submitted must embody the results of original research not previously published. The manuscript shall be typewritten, double spaced on bond paper, in English, and accompanied by all necessary photographs, drawings, diagrams, and tables, and shall be ready for publication. Papers must be accompanied by a summary of the data presented and conclusions reached.

(4) *Awards.* The awards shall be made by the Council of The New York Academy of Sciences, and its decision shall be final.

(5) *Publication.* The Academy shall have first option on the publication of all papers submitted unless other special arrangements have been made beforehand with the authors, but such publication is not binding on the Academy.

(6) Wherever and whenever published, the papers receiving the awards shall be accompanied by one of the three following statements:

Under award I, "Accorded an A. Cressy Morrison Award in Natural Science in 1960 by The New York Academy of Sciences;"

Under award II, "Accorded a Boris Pregel Award for Research in Nuclear Physics and Nuclear Engineering in 1960 by The New York Academy of Sciences;"

Under award III, "Accorded a D. B. Steinman Award for Research in Structural Engineering in 1960 by The New York Academy of Sciences."

Such a statement, in substance, must also accompany any formal publicity initiated by the author regarding the award paper. If published elsewhere with the consent of The New York Academy of Sciences, six copies of each award paper must be deposited shortly after publication with the office of The New York Academy of Sciences.

THE NEW YORK ACADEMY OF SCIENCES
2 East Sixty-third Street
New York 21, N. Y.

Eunice Thomas Miner
Executive Director

PROGRAM FOR THE EVENING *

After the Business Meeting the following program was given:

VIRUSES 1959

Hilary Koprowski

Retiring President, The New York Academy of Sciences, New York, N. Y.

"ANYBODY CAN MAKE HISTORY: ONLY A GREAT MAN CAN WRITE IT."
— Wilde

On Monday, January 18, 1712, the Duchesse de Bourgogne, wife of the grandson of Louis XIV and heir to the throne of France, arrived at court with "a face highly swollen" and went to bed sick. On February 5 she became feverish and, after a "bad night," developed an insupportable, violent headache that lasted, along with a fever, until February 8 and was not alleviated by smoking and chewing tobacco and repeated bleedings. On this day spots appeared on her skin, and the disease was tentatively diagnosed as measles, of which there were then epidemics in Versailles and Paris. However, the next day the condition of the royal patient deteriorated rapidly, and the royal physicians attempted to change their diagnosis, applying feeble *post hoc* reasoning. For the next few days, the dauphine was "treated" by frequent bleedings and administration of emetics, but she was lethargic, seldom conscious, and feverish. After a rapid downhill course, she died on the morning of February 12, 1712.

The Duc de Saint Simon, from whose *Memoirs*[1] I have extracted this description of the sickness and death of the Duchesse de Bourgogne, mentions that there were rumors that the dauphine was poisoned because on February 5, the day she took sick, she had received a new snuff box and was ostensibly poisoned by the snuff – which she was in the habit of taking unbeknownst to the king. Apart from the apparent absurdity of considering snuff both as a source of poison and as a method of treatment, there is other circumstantial but strong evidence that the dauphine was not poisoned.

Her husband, the Duc de Bourgogne, probably already unwell during his wife's sickness, became ill the day after her death and the symptoms and signs of his illness were unmistakably the same as those of the illness of his deceased wife. Again spots appeared, first on the skin of his face,

*A paper entitled "Public Information and Foreign Policy" was presented at the Annual Meeting, December 3, 1959, by Edwin Martin John Kretzmann, Deputy Assistant Secretary for Public Affairs, Department of State, Washington, D. C. This article will not be published by the Academy.

and then spreading over his entire body,[1,2] just as had occurred in the case of the dauphine. The duc's condition deteriorated rapidly – aggravated, no doubt, by the "treatments" he received from the royal physicians – and on February 18 he expired. The couple's five-year-old son, Louis, Duc de Bretagne, died shortly thereafter, following an illness of similar symptomatology.

In FIGURE 1 is shown the royal family of France painted by de Largillière in the year 1710. In the middle, in the black wig, is the Roi Soleil himself; leaning over his armchair is his only son, the Monseigneur, described devastatingly by Saint-Simon as "a man without vice or virtue, knowledge or understanding, and totally incapable of acquiring any."[2] On the right is the king's grandson, the Duc de Bourgogne, and the little fellow is his grandson, the Duc de Bretagne.

Two years later only the king, of the entire royal family, remained alive: Monseigneur died of smallpox and the Duc de Bourgogne, his duchess, and their son, of an infection that was probably measles, possibly complicated by encephalitis. *Passim paru*, one should mention that the second son of the Duke and Duchess of Bourgogne, the future Louis XV, two years old at the time of their death, was kept in hiding by his governess and thus probably escaped the infection or, if not the infection, what may have been worse, the attempts of the royal quacks to treat it.

This was the havoc wreaked by measles in 1712, which probably profoundly changed the course of the history of France. What do we know about measles in 1959, two hundred and forty-seven years later? The answer is that we now know quite a lot.

Although the viral etiology of measles was established in the year 1911,[3] progress in this field was essentially at a standstill until modern techniques of tissue culture research, developed in 1954, were applied to the study of the virus.[4] Introduction of these methods permitted isolation of the virus of measles from patients immediately before and after the appearance of the characteristic measles rash. Adaptation of the virus to a tissue culture system, such as normal human amnion culture or a primary culture of monkey kidney, makes it possible to develop practical serologic tests that can be used in any laboratory for diagnostic purposes. Techniques permitting determination of antibody against measles helped to solve a forty-year-old riddle: Why had attempts to transmit measles to monkeys yielded only extremely erratic results? Study of bloods of monkeys brought into the laboratory indicated that inapparent infection with measles virus is quite common in primates and that spread of the virus through a monkey colony, unnoticeable because of the lack of techniques for detecting antibody, accounted for the resistance of animals immune to transmission of measles virus from human patients.

Although measles is a relatively mild disease, not very alarming to the mothers of children stricken with it, two types of complication do occasionally occur. One represents the involvement of the central nervous

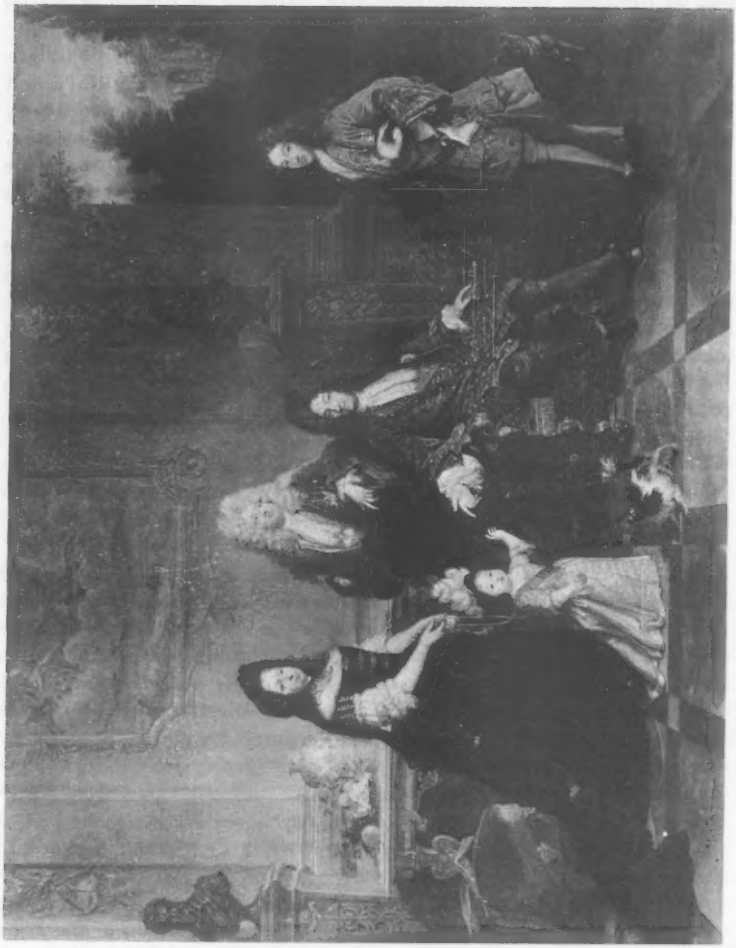

FIGURE 1. The Royal Family of France. Painting by Nicolas de Largillière.
Reproduced by permission of the Wallace Collection, London, England.

system following measles infection, with all the unpleasant and often tragic sequelae of an encephalitis. The other is a so-called giant-cell pneumonia, which is not so much a complication as a separate disease entity caused, as was recently shown, by infection with measles virus.[5,6] These two serious disease syndromes make it advisable, if not imperative, to find some method of preventing measles in humans. The use of an immune human serum, either to prevent or to modify the course of measles, has long been an accepted procedure in pediatric practice. However, this method of prophylaxis depends on recognition of the serum recipient's contact with a known case of measles. This is not always possible and, in the case of the above-mentioned giant-cell pneumonia, where the course of the disease is completely different from that of the normal measles syndrome, such a method of prophylaxis would be of no avail.

However, in 1959, considerable progress has been made toward the development of an effective measles vaccine. With the methods used for other viruses, attempts were made to attenuate the virus of measles so that it would be nonpathogenic for man but still capable of producing immunity. Modification of the virus has been achieved in an unnatural host, such as the developing chick embryo. However, the use of such a modified virus as a living virus vaccine for children was only partially successful. Although the vaccine immunized individuals to whom it was given, it often produced signs of illness, such as fever or slight malaise. These signs are by no means comparable in severity to those observed in a case of measles induced by a regular virulent virus, but they are an indication that further attempts should be made to change the character of the cultured virus so as to deprive it of all its disease-inducing properties.

Another curious relationship has been reported recently: that between the virus of measles and canine distemper.[7] It has been observed that dogs, after infection with canine distemper, develop antibodies that are apparently common to distemper and measles virus, and that children recovering from measles have antibodies which are also antibodies to distemper virus.[8] There is no indication, however, that measles can cause the dogs' illness or that, vice versa, distemper is pathogenic for children. The study of this phenomenon, of course, has not yet reached a stage where one could consider that canine distemper virus can immunize humans against measles and that human measles virus can immunize puppies against distemper. It is even possible that such a stage may never be reached. However, further attenuation of the measles virus through the employment of all known laboratory techniques may bring us to an era when children given the vaccine will be protected, probably for a lifetime, against measles. If such a vaccine had been available then, and the history of Eighteenth Century France could be relived, it might have run a different course, even if we believe, with George Bernard Shaw, that "kings are not born; they are made by universal hallucination."

Courtesy of the Wallace Collection, London, England.

"WE WITHER FROM OUR YOUTH, WE GASP AWAY,
SICK, SICK . . ." — Byron, *Childe Harold.*

On the evening of Easter day, April 19, 1824, a terrible storm had broken over the Greek town of Missolonghi. On the same day the stormy life of one of the greatest poets of the English language came to an end. Barely four months before, on January 22, George Gordon Byron had written the poem entitled: "On This Day I Complete My Thirty-Sixth Year." Three weeks later Byron suffered a convulsive seizure. Although the attack passed within a few minutes, the expected recovery did not take place, and throughout the month of March he frequently complained[9] of headaches, giddiness, and attacks of shivering. On April 9 the pain, fever, and giddiness returned with full intensity, and the condition of the poet deteriorated rapidly. Clear indication of cerebral involvement became apparent on April 15. Treatment – consisting of blood letting and administration of castor oil, calomel, and colocynth – was of no avail, and on April 18 Byron lapsed into stupor from which he never awoke.

The cause of death remained as mysterious as the true character of the poet. The results of the autopsy[10] indicated intense congestion of the dura mater and brain tissue and edematous swelling of soft membranes. The heart was dilated and fatty, and the liver was cirrhotic. These data are inadequate for establishing the cause of death, although the four physicians who performed the autopsy made the diagnosis of: "Metastasis (into the brain) of rheumatic inflammation." Byron suffered from malaria and a *post hoc* diagnosis of malignant malarial infection, passing into malarial coma and death,[9] cannot be excluded. On the other hand, Byron had suffered from tertian malaria since 1810, but there was no periodicity of attacks during the last phase of his illness. Puzzling though it is, it is not my purpose to discuss extensively the cause of Byron's death. Instead, I shall discuss a condition that had a profound effect on his whole life, namely, his lameness.

Edward John Trelawny, companion of Byron and Shelley, was present in Missolonghi at the time of Byron's death and, overcome by insatiable and unhealthy curiosity, decided to examine the limbs of the embalmed body of Byron.[11] Since the body was guarded constantly by the poet's faithful valet, Fletcher, who would never permit Trelawny to carry out his indecent scheme, Trelawny feigned faintness and asked Fletcher to bring him a glass of water from another room. He then uncovered Byron's feet and legs and claimed to have seen that "both his feet were clubbed and his legs withered to the knee – the form and features of an Apollo with the feet and legs of a sylvan satyr."[11] However, Byron had said before of Trelawny that he could not tell the truth "even to save his life," and Trelawny was lying. He corrected himself in his eighty-sixth year, when he finally admitted that Byron's "feet were perfect," except for "contraction of the back sinews, which the doctors call tendon Achilles, that prevented his heels resting on the ground."[11]

Further investigations, helped by the finding of the two surgical boots (for the same foot) made for Lord Byron, indicate that it was a unilateral lameness of the right foot, which was not clubbed but "was long and slender." Little's disease, a form of cerebral palsy resulting in spastic paralysis, had been suspected, but Byron's condition was not as severe as that encountered in victims of Little's disease, since he was an excellent swimmer and could indulge in other athletic exercises. This leaves us with only one possible diagnosis: poliomyelitis in infancy leading to paralysis of the foot and leg muscles, recompensated later by contraction.

Assuming that the diagnosis of poliomyelitis infection is correct, and assuming that Byron could have the fortune – or misfortune – to be born on January 22 in the year 1960 instead of 1788, would the means of preventing infantile paralysis and its sequelae be available? The answer to this question is related, strangely enough, to geography. If his birth had taken place in 1960 in London, England (where he was born, on Cavendish Square, in 1788), the possibility of preventing polio infection shortly after birth would have been almost nil, and Byron could have remained lame throughout his lifetime. Strange as it may sound, however, if he were born in 1960 in the Belgian Congo, the Union of Soviet Socialist Republics, Poland, or Czechoslovakia, he would quite possibly have been vaccinated within hours after birth with live polio vaccine, thus probably acquiring lifetime protection against poliomyelitis.

In the year 1959 the total number of persons who have received live poliovirus vaccine will probably exceed 20 million. Although United States scientists are responsible for the experimental work leading to the development of a live virus vaccine against polio, for its original application to man, and for the development of the strains of virus used in mass vaccination programs in other countries, the United States still lags behind in the application of the vaccine to its own population. This paradox may be related to the fact that countries such as the United States and Great Britain could afford much wider application of the inactivated virus vaccine, which was found to protect a certain portion of vaccinated subjects against paralytic disease. Thus the need to employ the live virus vaccine has not been so urgent. However, the advantages of live virus vaccination are now beyond dispute. Work completed in 1959[12] indicates that children originally vaccinated in 1950 still possess protective antibodies in their blood. Duration of immunity following inactivated virus vaccine is not as yet precisely determined, and the possibility remains that it might be necessary to repeat the injections at yearly or biyearly intervals. Administration of live virus by the oral route makes it easier to carry out mass-vaccination programs[13] and give immediate protection to large segments of a population. In addition, the live virus vaccine can be administered within a few hours after birth, a fact of paramount impor-

tance if we consider that this may prevent an early onset of polio – as may have occurred in the case of Byron.

Thus, at the close of the year 1959, the prospects for the prevention and possible eradication of the disease that may have caused Lord Byron's unfortunate condition and probably strongly influenced his behavior as a man and as a poet are very bright indeed. This may, of course, be the sort of optimism Gilbert K. Chesterton defined as: "The noble temptation to see too much in everything."

"LOOK ME OVER ONCE,
LOOK ME OVER TWICE ..."
– Johann Strauss, *Die Fledermaus*

In a scene from a highly imaginative thriller, a prosaic English solicitor, Jonathan Harker, kept prisoner in a strange castle located in the Transylvanian mountains, looks out the window of his unwanted abode and writes in his diary: "As I leaned from the window my eye was caught by something moving a storey below me, and somewhat to my left, where I imagined, from the order of the rooms, that the windows of the Count's own room would look out. The window at which I stood was tall and deep, stone-mullioned, and though weatherworn, was still complete; but it was evidently many a day since the case had been there. I drew back behind the stonework, and looked carefully out.

"What I saw was the count's head coming out from the window. I did not see the face, but I knew the man by the neck and the movement of his back and arms. In any case I could not mistake the hand which I had had so many opportunities of studying. I was at first interested and somewhat amused, for it is wonderful how small a matter will interest and amuse a man when he is a prisoner. But my very feelings changed to repulsion and terror when I saw the whole man slowly emerge from the window and begin to crawl down the castle wall over that dreadful abyss, face down with his cloak spreading out around him like great wings. At first I could not believe my eyes. I thought it was some trick of the moonlight, some weird effect of shadow; but I kept looking, and it could be no delusion. I saw the fingers and toes grasp the corners of the stones, worn clear of the mortar by the stress of years, and by thus using every projection and inequality move downwards with considerable speed, just as a lizard moves along a wall.

"What manner of man is this, or what manner of creature is it in the semblance of a man? I feel the dread of this horrible place overpowering me; I am in fear – in awful fear – and there is no escape for me: I am encompassed about with terrors that I dare not think of ..."[14]

What sort of a being was Dracula? Bram Stoker's classic novel[14] deals with centuries-old folk tales of vampires and vampirism. According to

Hurst's definition,[15] "A vampire is a dead body which continues to live in the grave, which it leaves, however, by night, for the purpose of sucking the blood of the living, whereby it is nourished and preserved in good condition instead of becoming decomposed like other dead bodies." The drinking of blood for the purpose of temporary resurrection has its roots in prehistoric antiquity. The shades in Hades drank the blood of Odysseus' sacrifice in order to have their lives temporarily renewed and to establish humanlike contact with the son of Laertes from Ithaca. Vampirism seemed to be contagious, since a person whose blood was sucked by the vampire became a vampire himself. This superstition, which had been spreading slowly through Europe, reached almost epidemic proportions in the years between 1723 and 1735,[15] particularly in Hungary and Serbia. An account signed by three regimental surgeons and countersigned by their commanding officer, dated June 7, 1732,[15] describes a soldier, one Arnold Paole, who returned from his military duties to his native village of Meduegna, near Belgrade, and confessed to his fiancée that while stationed in Kasove he had a visitation from an "undead" person and was afraid of the haunting spectre of the vampire. Although his brave fiancée succeeded in calming his fears, Arnold behaved strangely and shortly afterwards died as a result of an accident. Within a month after his interment he began to haunt the neighborhood and, when four persons died after exhibiting suspicious symptoms of vampirism, the commission of military surgeons decided to disinter Arnold's body to see if it had become a vampire, that is, to see if it were in a state of decomposition or resembled a living body. After confirmation of its undead state, the body received the antivampire treatment, which consisted of driving a stake through its heart. The same treatment was given to the bodies of the other four dead men who were suspected of vampirism. Apparently vampirism was not extinguished in the village of Meduegna, since five years later more people were dying in vampirelike circumstances. The same medical commission disinterred twelve bodies in the cemetery, ten of which, including that of an eight-year-old boy, were considered to be vampires and received the prescribed treatment. Driving a stake of ash wood through the chests of supposed vampires, of whom suicides were the chief suspects, became such a pastime in Europe that in 1823 a law was enacted in England specifically prohibiting mutilation of the body of a suicide, or *felo de se*, as he was called, by driving a stake through his body.[15]

Before discarding vampirism as an old wives' tale, perhaps it would be wise to consider that vampires may not have been the creation of pure fancy, but were perhaps a spiritual sublimation of accounts of a specific disease. Consider the "epidemic" of strange deaths in Meduegna and in a village in Transylvania where, in 1732 within the space of three months, seventeen persons of different ages died of alleged vampirism. We are back in Transylvania, where the castle of Dracula was located. Although

Stoker never named the animal Dracula resembled in his nightly wanderings, the description of the spectre resembles a bat, and bats and vampires were often interchangeable in European witchcraft tales. Transylvania is literally studded with caves that certainly harbor bats. A person who became a vampire was invariably one who had been bitten and whose blood had been drawn; but could the biter have been a bat and not another human being in an un-dead stage? Were these bats by any chance infected with rabies virus, and had this infection been transmitted to their human victims, causing the horrible syndrome of hydrophobia and the dreadful death that always followed? Early in the Sixteenth Century Petrus Martyr Anglerius, the first bishop in the New World, wrote in his book *De Rebus Oceanicis et de Orbi Novi Decades Octo:* "In several places bats not much smaller than turtle doves used to fly at them in the early evening with brutal fury and with their venomous bites brought those injured to madness." Further on, in the second volume of this work, he says: "They say that large bats, not smaller than turtle doves, come in from the marshes on the river and attack our men with deadly bite."*

Not far from Petrus Martyr's original diocese, in the 1930s, the natives of Trinidad were suffering from a fatal disease of the central nervous system, the causes of which were unknown and remained so for several years until an ingenious scientist, J. L. Pawan, observed[16] that natives sleeping outside their dwellings because of the heat were often attacked and bitten during the night by dark, quick-moving creatures whom Pawan ultimately recognized as bats. The human victims, who never felt the bites, became sick six weeks later and died of rabies. The bat that transmits the disease must sustain itself by feeding on animal blood – hence the appropriate name of "vampire bat." Vampire bats exist throughout Central and South America, where they often decimate herds of cattle by transmitting rabies and even attack man himself. Insofar as is known, the vampire bat species has not been seen anywhere else in the world, not even in Transylvania. There and in other places the insectivorous and fruit-eating bats are prevalent. Can these become rabid? Following his trail of investigations, Pawan[16] observed a furious daylight fight in the air between a vampire and a nonblood-sucking bat. The chain of transmission had been established – an insect-eater may become rabid.

In November 1951, the wife of a cotton planter died in a Dallas, Texas, hospital after a fulminating disease involving the central nervous system. Autopsy revealed that she was a victim of rabies. There was no history of exposure to an animal usually associated with transmission of rabies, that is, a dog or a cat, but her husband reported that early in October she had been bitten by a bat, which had flown away. Two years later, near Tampa, Fla., rabies virus was isolated from brain tissue of an insect-eating bat which, in broad daylight, had bitten a boy. From that time up

*Quoted in translation and by permission of Olof Ryberg, of the Biological Institute, State College, Alnarp, Sweden.

to the present twenty-three states of the union have reported rabid bats, found occasionally in such unusual places as a football stadium at Ohio State University, Columbus, Ohio, and the screen door of a laboratory at Fort Sam Houston in San Antonio, Texas. There have been three human deaths following exposure to bat attacks. These were all insect-eating bats which normally would refrain from feeding on human blood. Apparently, however, rabid bats lose their sense of taste and attack man and, possibly, animals while flying in daylight – itself a most unusual performance. These rabid bats are not limited to the Western Hemisphere. The first European capture of a rabid bat occurred in, of all places, Yugoslavia, the country of the Meduegna "epidemic" of vampirism in the Eighteenth Century. Were rabid bats more prevalent then than they are today? Had they attacked and transmitted the disease to many more victims than we hear of today? Did persons suffering from hydrophobia in these earlier times exhibit signs of so-called furious rabies, attacking other human subjects and causing rabies infection? We do not know. However, it should be remembered that in 1956 a plasterer in Anaheim, California, suffering from rabies, in the course of a single night bit, scratched, and otherwise exposed twenty-two subjects, who were advised to take a course of antirabies treatment.

Thus the spectre of Dracula is still with us, and the rabid bats, vampire and nonvampire, will haunt us for a long time to come.

"JE CONNAIS LE TRAVAIL; ET LA SCIENCE
EST TROP LENTE. QUE LA PRIÈRE
GALOPE ET QUE LA LUMIÈRE GRONDE ..."*
– Rimbaud: *Une Saison en Enfer*

Those of us who enjoy poetry know the seductive practice of ranking poets in neat classes of first, seconds, and thirds. This is as bad a custom as treating all poets as if they were the same, disregarding the fact that what matters is the distinguishing quality of the individual genius and preferences based on the bias of our individual temperaments. What I happen to prefer is the poetry of a genius, Arthur Rimbaud, who ceased to write at an age when others were only beginning. Here is this poet's picture (FIGURE 2) at the time of his first communion: an eleven-year-old boy with "angelic countenance," with lovely, wide ingenuous blue eyes, who was a deeply religious pupil at the Collège de Charleville in France. Four years later, at the "ripe" age of fifteen, the first outburst of poems began to flow from his pen.

"Je ne parlerai pas, je ne penserai rien,
Mais l'amour infini me montera dans l'âme,

*"I know what toil is; and science is too slow.
Let prayer gallop and light thunder . . ."[18]

Et j'irai loin, bien loin, comme un bohémien,
Par la Nature – heureux comme avec une femme."*

This shows already a freedom of language and a poetic expressiveness rarely surpassed. The same year Rimbaud fled home to Paris, a performance to be repeated again and again during his life. He was returned after a week under arrest, and he then ran away again. All this time poems were gushing from his pen. At the mature age of seventeen he composed– I use this word in its musical sense – a poem, *Bateau Ivre*, which for me, with all the bias of my individual taste, represents the summit of verbal virtuosity and originality and the greatest depth of emotional feeling and sheer evocative magic. This poem was written by a sixteen-year-old boy who had never seen the sea. It ends with these stanzas:

Si je désire eau d'Europe, c'est la flache
Noire et froide où vers le crépuscule embaumé
Un enfant accroupi plein de tristesses, lâche
Un bateau frêle comme un papillon de mai.

Je ne puis plus, baigné de vos langeurs, ô lames,
Enlever leur sillage aux porteurs de cotons,
Ni traverser l'orgueil des drapeaux et des flammes,
Ni nager sous les yeux horribles des pontons.†

There were four more years of outpourings of poetic craft unsurpassed, to my taste, by anyone. A stormy, often sad, unsatisfied existence was carved out by Rimbaud during these years. Then, in 1873, the embittered 19-year-old burned all his manuscripts and remaining copies of *Une Saison en Enfer* as a symbolic act of repudiation of his short literary life. Many think that afterward he wrote nothing. Certainly, he was completely silent after 1875. He became a wanderer, an unsettled soul of a poet who apparently became proficient in the art of piano playing, while suffering constantly from wanderlust. He finally settled in Abyssinia and became a coffee exporter, a gun runner, and a general trader in Harrar. He was now working furiously to save money, to save money in order to return to France as a respected bourgeois; family life, once disregarded and despised, was now returning constantly to his thoughts. Return he did, but

*"I'll have no need for words, not even for thoughts;
Through my soul will flood love, a measureless tide;
And far, like a gypsy, with Nature I'll range
As happy as though a girl lay by my side."[19]

†"If there's one sea in Europe that I yearn for
It's the black chilly pool where joylessly
A small child crouching in the sweet dusk launches
A boat as frail as a May butterfly.

No more I'll bathe my hull in languid waters,
Nor join the pride of pennant's pageantry;
No more I'll track the flying cotton clippers,
Nor float where convict ships leer down at me."[19]

FIGURE 2. Arthur Rimbaud at His First Communion. Reproduced by permission from *Arthur Rimbaud*, by E. Starkie, 1947. Hamish Hamilton Co., London, England.

not as he imagined. In February 1891 he suffered from a recurrent pain in the region of his kneecap, which received the usual spartan treatment of violent exercise. The pain did not disappear but became worse, and a swelling became apparent above and below the knee joint. Soon Rimbaud could not bend his knee. He became seriously ill, was carried by porters to an Abyssinian port and, after inhuman suffering, reached Marseilles by boat. Here his leg was promptly amputated, though physicians were sceptical about the final outcome of his illness, since they suspected a cancerous growth of the thigh, which would probably be called an osteosarcoma today. His physicians' pessimistic prognosis was correct, and Rimbaud died on November 10, 1891, a victim of cancer of the thigh bone. Now acclaimed in Paris as the genius of French poetry, Rimbaud was buried in Charleville at a funeral attended only by his sister and his mother, under the latter's strict orders to exclude anyone even remotely associated with her son's literary past, which she considered to have accounted for his downfall.

If Rimbaud suffered from cancer of the bone today, would his chances of recovery be greater? Would we know more about the cause of the disease? Insofar as the first question is concerned, the answer is, unfortunately, that they would not be better. Although present-day physicians are probably more suspicious of the presence of malignant neoplasm than were their predecessors, the chances for a long survival of persons suffering from Rimbaud's cancer are few, perhaps as few as in his time.

On the brighter side, however, are reports of progress in studies on the cause of cancer. In the last few months Grace *et al.*[17] have injected cell-free extracts of osteosarcomas (tumors of the sort that killed Rimbaud) and several other human tumors into newborn mice. Six months later a sizable fraction of the tumor-injected mice developed mammary cancers. The cell-free extracts of human tumors may have contained a virus or substance capable of stimulating the proliferation of mouse mammary gland into a malignant state. Other reports[20] indicate that injection into mice of extracts from human leukemia (cancer of the blood) may similarly stimulate the experimental host to react with the development of leukemia. The study of tumor viruses on the cellular level has made great strides in 1959. Tumorlike changes have been induced by Stewart[21] in human tissue grown *in vitro* in tissue culture under the influence of an extract of human cancer. Two viruses, Rous sarcoma and polyoma, which cause cancer of birds and of mice, hamsters and rats, respectively, were found to cause proliferative changes in tissue cultures obtained either from chick[22] or hamster embryos.[23] What does this mean?

Because of the complexity of animal and human organisms, it would be premature to consider viruses as the sole cause of cancer. In fact, such an exclusive etiology may never be satisfactorily proved, since many other factors, hormonal, genetic, and homeostatic, may play equally prominent roles. What is important is the emergence of a changing concept of

the role of viruses, a concept that would permit us to evaluate the overall role of viruses in the etiology of malignancy. Based on brilliant work done with bacterial viruses, the bacteriophages, this concept sees animal viruses as transmitters of genetic information between cellular systems, silent standbys of ongoing intracellular metabolism. The health of the individual cell may not be affected, yet the virus, acting sometimes as a passenger in the cytoplasm and sometimes as a gene attached to a nucleus, alters its metabolism. This is the concept of episome developed by Jacob and his colleagues,[24] which can be expressed by the motto of *"virus fiat ubi vult."** This changed concept of the mechanism of formation of malignant cells has compelled us to re-evaluate, to a certain degree, our traditional notion of virology as a discipline *sui generis*. Now we see that viruses do not act only as cell and tissue destroyers but as parts of normal animal cells, participating in growth, differentiation, and other cell and organ functions. Thus virology covers biology, biochemistry, cytology, and any other discipline dealing with the basic principles of life, whether at the level of the whole organism or at the cellular level.

Many of the views developed in 1959 as the result of thorough study would barely have passed the test of sanity several years ago. With the force of belief behind them, many current views will undergo changes in the future. The progress of mankind will continue but, at the same time, nature will not be outwitted. Although we may live longer and healthier lives, we shall certainly be spared the horrible fate of the Struldbrugs, the immortals of Jonathan Swift's *Gulliver's Travels*, who are portrayed as the unhappiest creatures in the world and who prompted Gulliver to remark: "My keen appetite for perpetuity of life was much abated. I grew heartily ashamed of the pleasing vision I had formed, and thought no tyrant could invent a death into which I would not run with pleasure from such a life."

*"Let the virus appear where it will."

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*SECTION OF GEOLOGICAL SCIENCES**

SOME OBSERVATIONS ON STRUCTURE AND METAMORPHISM IN THE HARRISBURG, N.Y. QUADRANGLE*

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The Harrisburg quadrangle is in the southeastern Adirondack Mountains, near the border of the massif, but entirely within the Precambrian complex of the mountains. All the rocks of the quadrangle have been metamorphosed. The predominant rocks in the area are Grenville gneisses and rocks derived from them during metamorphism. The major intrusive rocks are hornblende granite and anorthosite, and there is a minor amount of gabbro. Brief descriptions of the major rock units follow.

Grenville Gneiss

The most abundant of the Grenville rocks in the area is a banded gneiss, the chief minerals of which are quartz, microcline, plagioclase, and garnet.

"Meta-Grenville" Gneiss

In this rock the banding is partially to wholly destroyed and, in general, the grain size is coarser than in the typical banded Grenville gneiss, but the rock is still recognizable as having been part of the Grenville sequence. The term meta-Grenville is a working name only and will be superseded by more accurate petrographic descriptions when the work is complete. This rock has basically the same mineralogy as the above Grenville gneiss, except that it has hornblende as an important constituent.

Porphyroblastic Gneiss

There is a gradual change, traceable in the field, from the Grenville gneiss to this rock, with an increase in the amount of microcline and a decrease in biotite and garnet. The porphyroblasts are of microcline and most of them are crushed, although there are areas in which large uncrushed porphyroblasts show good Carlsbad twinning.

Alaskitic Gneiss

This rock is composed almost wholly of quartz and microcline, with only a small percentage of biotite or garnet, or both. Most exposures show

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The Division of Nuclear Physics held a meeting on December 9, 1959 at which John Harley of the Health and Safety Laboratory, Atomic Energy Commission, New York, N.Y., presented a paper entitled "Radioactive Fall-out." This paper will not be published by the Academy.

a high degree of shearing, with quartz blades marking both foliation and lineation. As a rock unit in the field it is variable, having shreds of biotitic gneiss scattered irregularly through it; some remnants of Grenville gneiss still show relict banding.

Hybrid Gneiss

This is a rock of fairly uniform appearance. It occurs as a gradational type between the typical Grenville biotite garnet gneiss and the hornblende granite gneiss, and is apparently a product of mixing (and perhaps later recrystallization) of the two. In addition to quartz, microcline, and plagioclase, it has both biotite and hornblende in varying amounts. It is foliated, but does not show any of the typical Grenville banding.

Hornblende Granite Gneiss

This rock consistently has quartz, microcline, plagioclase, and hornblende as major constituents and, in some areas, has appreciable garnet or pyroxene, or both. It is very uniform in appearance over large areas, and is the major igneous rock of the quadrangle.

Anorthosite

Anorthosite occurs only in the northwestern corner of the quadrangle, at the edge of a large body that lies to the north. It is typical of the Adirondack anorthosites, having variable composition (some being gabbroic) and variable texture, part being thoroughly crushed and part having a considerable percentage of plagioclase porphyroclasts.

Gabbro

The gabbros of the quadrangle are very minor in quantity. They display good ophitic texture and reaction minerals typical of metamorphosed gabbros.

Considering the banded Grenville quartz-microcline-plagioclase-biotite-garnet gneiss as a sort of "parent rock," it is suggested that the porphyroblastic gneiss, the meta-Grenville gneiss, and the alaskitic gneiss were derived from this one major type by differing degrees and perhaps different processes of metamorphism. The gradational change from the "standard" Grenville gneiss of the area into the porphyroblastic gneiss can be traced step-by-step in the field; while similar changes across consecutive outcrops cannot be clearly seen for the other two rock types, nevertheless individual outcrops showing all intermediate stages can be found.

The hornblende granite gneiss is considered to be igneous in origin because of its uniform appearance over extensive areas and because it appears to intrude the Grenville gneisses in some areas in the form of

sills. Furthermore, inclusions of the Grenville sequence in the hornblende granite gneiss are of common occurrence.

By the same token, the homogeneous character of the anorthosite is considered good evidence for its igneous origin. The gabbro bodies of the quadrangle, although altered, show ophitic texture and relict minerals typical of usual plutonic gabbros.

The hybrid gneiss seems to be just that – a mixture of Grenville gneiss and hornblende granite gneiss, exhibiting some of the characteristics of each.

All the major rocks of the quadrangle show foliation of lineation, or both. Foliation is visible on most outcrops and, in many cases, a linear element is also present in the plane of foliation. Foliation is marked in different rocks by parallelism of platy minerals (chiefly biotite), phacoids of feldspar, clots of hornblende, and blades of quartz. Lineation is strongest in those rocks that have been intensely sheared, and the aforementioned quartz blades are the outstanding linear element in these rocks.

In some zones lineation is so strongly developed that the foliation becomes obscure. On joints and erosion surfaces roughly parallel to the lineation an apparent foliation is seen. However, joint faces striking at approximately right angles to the lineation show that the linear elements are not oriented parallel to any one plane. In these localities the quartz is no longer in blades but in spindles, and the rock becomes more or less a pencil gneiss.

In the southern half of the quadrangle, foliation trends indicate open folds, up to five or six miles across. The principal structure in this area is a large anticline, its axis striking about 115° and plunging to the east. The folding is asymmetrical, with the northern limb dipping more steeply.

The structure in the northern half of the quadrangle is much less obvious. Virtually all foliation dips south, and trend lines are discontinuous. In a few places the trends suggest isoclinal folding, and this seems the most likely explanation for the structure in the entire northern sector of the quadrangle. Critical exposures are lacking in many cases, and faulting has disrupted the existing trends, making unequivocal interpretation very difficult.

One of the most striking structural features of the area is the consistent southeasterly plunge of lineation. This is especially pronounced in the rocks thought to be derived from the Grenville gneiss, and is also present in the anorthosite. The hornblende granite gneiss and the hybrid gneiss have a strong lineation plunging to the northeast, in marked contrast to the other rocks.

As the southeasterly plunging lineation is so widespread and is found in so many of the rocks of the quadrangle, it is thought to be an expression of a major deformation affecting the entire region and all of the

rocks present at the time of deformation. If this is true, then by extension the hornblende granite gneiss was *not* present at the time of this deformation, but was intruded at a later date under differently oriented stresses, giving rise to the northeasterly plunging lineation. Presumably the hybrid gneiss was developed at this same time.

This interpretation can be employed to establish a possible chronology for the area. Following the formation of the Grenville gneiss (how many steps this involved is in question), anorthosite was intruded. Either at the time of this intrusion or later, the whole area was deformed, with accompanying granitization of parts of the Grenville sequence and folding and shearing of the entire region. Subsequent to these events, the hornblende granite was intruded and deformed, combining with the Grenville rocks in some areas to form a hybrid gneiss. No evidence bearing on the time of emplacement of the several small gabbro bodies has been found in the quadrangle. Considering the petrologic affinity between the gabbro and anorthosite, it is assumed that the gabbro was an early intrusive.

Whether or not faulting played a part in the early history of the area is highly problematical. That it has been important in later periods is well substantiated. Faulting is recognized by the presence of gouge, breccia, reversals in the plunge of lineation, offset of rock types on opposite sides of fault lines, and by anomalous strike and dip readings on foliation. Reversals in the plunge of lineation along fault lines and anomalous foliation readings suggest that faulting was subsequent to the major period of deformation. Angular fragments of the hornblende granite gneiss in fault breccias indicate movement following the emplacement and deformation of this rock. In the Lake Pleasant quadrangle, which adjoins the Harrisburg quadrangle on the west, Ordovician limestones are preserved in small graben, where the more resistant Precambrian rocks have protected them from erosion. This places some fault activity in the middle or upper Paleozoic at the oldest. Possibly the faults have been active in much more recent time. Strong topographic trends follow those faults which have been authenticated, and parallel trends suggest the hidden presence of many others.

The drainage of the quadrangle is controlled by major fault lines and by joint sets parallel to these faults. This gives rise to a somewhat rectangular drainage net, and to rather blocky topographic units.

In some parts of the quadrangle differential erosion has produced prominent scarp and dip slopes, directly controlled by the strike and dip of the foliation.

Summary

Tentative interpretation of the geologic history of the quadrangle suggests the following sequence:

(1) Emplacement of anorthosite and gabbro intrusives into pre-existing Grenville gneiss, followed or accompanied by deformation and by granitization of the Grenville rocks.

(2) Later intrusion and deformation of hornblende granite, which combined in some places with Grenville rocks to form a hybrid gneiss.

(3) Faulting, possibly reactivated at successive intervals.

(4) A long-continued erosion, continuing through much of the later history of the quadrangle and giving rise to land forms modified by fault and joint lines and by the structure and variable resistance of the bedrock.

METHODS, PROBLEMS, AND RESULTS OF GROWING PLANT CELLS UNDER SUBMERGED CONDITIONS*

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Introduction

Large amounts of plant material may be produced by growing specific tissues of higher plants in liquid media (Tulecke and Nickell, 1959). This paper presents the results of our experience with several techniques for plant cell culture under submerged conditions. The most useful technique is a carboy culture system that handles 10 l. of medium.

Recent work by Melchers and Bergmann (1959) and earlier work by Muir and Hildebrandt (1953), Nickell (1956), Caplin and Steward (1949), and others has contributed to our knowledge of plant cells growing in liquid media. None of these investigations was concerned with the large-scale culture of particular cell lines or with the possibility of producing natural plant products. Our aim included both of these possibilities, the additional uses for transformation reactions, and the study of the biochemistry of certain tissues. Further use of such volume cultures for virus production has already been suggested by the important results of Bergmann (1959), who obtained tobacco mosaic virus production in tobacco tissues grown in liquid media. The work of West and Mika (1957) on the production of atropine by callus cultures of belladonna suggests the feasibility of producing natural products.

Methods

Standard methods for the isolation and maintenance of plant tissue cultures were employed (White, 1943). Because of their rapid rate of growth, four tissues were selected for large-volume growth studies; these were *Ilex aquifolium* stem tissue (holly), *Rosa* sp. stem tissue (Paul's Scarlet Rose), *Lolium perenne* endosperm, and *Ginkgo biloba* pollen tissue, strain 5857. The first two tissues were grown on media containing White's medium (1943), 2,4-dichlorphenoxyacetic acid (6 ppm), and coconut milk (18 per cent). The *Lolium* tissue was grown on a modified White's medium with yeast extract added (Norstog, 1956) and the *Gingko* tissue on a synthetic medium containing 100 ppm arginine (Tulecke, 1959). All of these tissues are established cultures that have been transferred at least 25 times over a minimum of 2 years. In measuring the growth of

*This paper, illustrated with slides, was presented at a meeting of the Section on December 14, 1959.

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these tissues, the term growth value is used; it represents the final wet weight divided by the initial wet weight.

Carboy Culture

Several devices were used for the scale-up of liquid cultures to large volume. These included Erlenmeyer flasks (300 ml.), Fernbach flasks (3 l.), carboy jars (20 l.), stainless steel tanks (30 l.), and Pilot Plant tanks (134 l.). In each of these devices it was necessary to agitate and aerate the cultures by using a shaker or by bubbling sterile air through the medium. Inoculation, medium additions, and sampling were done by syringes fitted with large needles (for the flasks) or by a system of tubes for the larger cultures (as described below for the carboy jars).

In general, the tissues are maintained in shake cultures in 100 ml. of medium in 300-ml. Erlenmeyer flasks; they are agitated on a New Brunswick gyrorotatory shaker. To prepare the inoculum for a carboy, the contents of a 300-ml. Erlenmeyer (100 ml.) are syringed into 900 ml. of medium in a Fernbach flask; this culture is also agitated on a shaker. When sufficient growth occurs (1 to 3 weeks), this 1000 ml. of culture is inoculated into the carboy jar containing 9 l. of medium.

The carboy culture system is shown in FIGURE 1; it provides a convenient and relatively simple apparatus for growing large amounts of

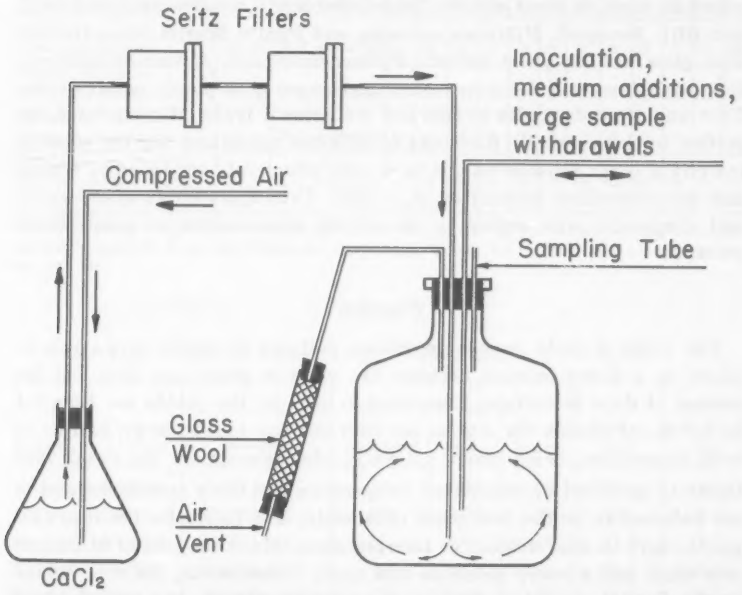

FIGURE 1. The carboy culture system for growing large amounts of plant tissue under submerged conditions.

plant cells. Culture inoculum or liquid media are added to the sterile carboy by clamping the air intake and sampling tubes and applying vacuum to the air vent; the medium or culture enters through the inoculation tube. The reduced pressure is equalized by admitting air through the two Seitz filters. The rubber stopper, through which the stainless steel tubing is inserted, is tightly secured with adhesive tape to prevent the leakage of air. The cotton-stoppered sampling tube is used to obtain small samples; syringes equipped with long, large-bore needles work well for samples of the more friable tissues. The inoculation tube is used to withdraw larger samples; sterile rubber tubing is connected to it and attached to a sterile side-arm Erlenmeyer flask (not shown in FIGURE 1). Sterile tubing from the side arm to a Seitz filter completes the apparatus. By clamping the air vent and sampling tube and applying vacuum to the Seitz filter attached to the inoculation tube, the sample may be collected in the side-arm Erlenmeyer flask. The reduced pressure in the Erlenmeyer is equalized by slowly admitting air through the Seitz filter.

Crude raw materials that will substitute for coconut milk were sought. For large-volume cultures coconut milk is a relatively expensive component of media and is not always readily available. It was found (TABLE 1) that some substances could be used as substitutes for coconut milk for certain tissues. *Agave toumeyana* tissue grows well on several crude materials such as yeast extract, liver-L-fraction, Lactalbumin, blood meal, and BBL Mycophil. *Hibiscus syriacus* and Paul's Scarlet Rose tissues also grow well on yeast extract; *Persea americana, Datura stramonium, Ilex aquifolium,* and *Solanum tuberosum* tissues grow poorly on all media. This use of crude media to find out the general types of compounds important to the metabolic functions of different organisms and the relative toxicity of other substances has been very effectively employed by Hutner and his co-workers (Hutner *et al.*, 1958). This approach is also helpful and diagnostic with regard to the growth requirements of plant tissue cultures.

Results

The yield of cells from large-volume cultures is shown in TABLE 2. There is a direct relation between the yield in grams per liter and the number of days in culture. Converted to pounds, the yields are from 0.4 to 5.7 lb. of tissue. On a gram per liter per day basis the production is less impressive, being about 3.0 gm./l./day (except for the rose); this figure is qualified by suboptimal temperature and other conditions and is not believed to be the best yield obtainable. The figure for the rose (9.7 gm./l./day) is also subject to interpretation, since the period of culture was short and a heavy inoculum was used. Nonetheless, the rose tissue is the fastest grower in tubes and in liquid culture. The growth value (final weight/initial weight) for the rose after 4 weeks' growth in test

TABLE 1

THE GROWTH RESPONSE OF TISSUE CULTURES TO CRUDE MEDIA

Tissue culture	*Growth value*	*Stock medium*	*Replacements of coconut milk in stock medium**											
			Soybean meal	*Casein hydrolysate*	*Distillers solubles*	*Malt extract (Difco)*	*Yeast extract (Difco)*	*Blood meal*	*Liver-I-fraction*	*Lactalbumen-peptone*	*Lactalbumen*	*Rice polishings*	*Skim milk*	*BBL Mycophil*
Agave *(Agave toumeyana)*	4.8	W-2,4-D-CM	2	4	1	4	5	5	6	6	4	3	4	5
Rose-of-Sharon *(Hibiscus syriaca)*	12.0	W-2,4-D-CM	4	4	1	2	6	2	2	2	4	0	1	3
Maidenhair *(Ginkgo biloba)*	14.4	W-P-Arg.	2	4	2	2	4	0	3	0	4	0	4	5
Rose, Paul's Scarlet *(Rosa sp.)*	31.0	W-2,4-D-CM	0	0	0	4	5	3	1	1	4	0	0	5
Yam *(Dioscorea composita)*	5.0	W-2,4-D-CM	3	5	0	0	0	0	0	0	0	0	6	-
Holly *(Ilex aquifolium)*	23.5	W-2,4-D-CM	4	0	0	0	3	0	0	0	0	0	0	0
Potato, Pontiac *(Solanum tuberosum)*	14.3	W-2,4-D-CM	2	0	0	0	0	0	0	0	1	0	1	0
Avocado *(Persea americana)*	6.2	W-2,4-D-CM	0	0	0	0	0	0	0	0	0	0	0	1
Datura *(Datura stramonium)*	10.5	W-2,4-D-CM	0	0	0	0	0	0	0	0	0	0	0	0

*The number represents a comparison with the growth on the stock medium, which is arbitrarily equal to 5. In the medium for the *Ginkgo* tissue, the replacements were made for the arginine.

TABLE 2

THE YIELD OF PLANT CELLS FROM LIQUID CULTURES

Tissue	*Culture system*	*Medium*	*No. of days cultured*	*Final yield (gm.)*	*No. of liters*	*Grams/ liter*	*Gm./l./ day*
Gingko	Carboy	W+P+Arg	28	870	10	87.0	3.1
Holly	Carboy	W2,4-DCM	20	626	10	62.6	3.1
Ginkgo	SS tank	W+P+Arg	14	1047	28	37.4	2.6
Lolium	Carboy	W+P+YE	6	205	10	20.5	3.1
Rose	Pilot plant	W2,4-D+ME+ YE+CM(5%)	2	2608	134	19.5	9.7

tubes is 28; growth values for the other tissues after a similar time are *Lolium* 25, holly 23, and *Ginkgo* 17. These are based on initial inocula of 200 to 500 mg. divided into 5 test tubes of media. Growth values obtained from liquid shake cultures (300-ml. Erlenmeyers with 100 ml. of medium) are higher; rose is 35, *Lolium* 34, holly 43, and *Ginkgo* 25 after 4 weeks' growth.

Not shown in TABLE 1 is the yield of cells on a mg./ml. basis for certain experiments. The *Ginkgo* tissue was used for these determinations because it is friable and because the cells are more easily counted. The *Ginkgo* tissue in the stainless steel tank experiment started at 11.4 mg. of tissue per ml. and reached 39.2 mg./ml. after 14 days; the carboy culture began at 10 mg./ml. and reached 87 mg./ml. after 28 days. The number of cells per mg. was determined by weighing an exact amount of tissue (2 to 3 mg.) on a slide, staining with acetocarmine, and counting the total number of cells. The average of three counts gave approximately 1800 cells/mg. On this basis, the SS tank culture began with 20,160 cells/ml. and rose to 70,560 in 14 days (3.5 fold increase); the carboy culture started at 18,000 cells/ml. and rose to 150,600 cells/ml. after 28 days (9.0 fold increase).

Our yields exceed those previously reported in earlier work by Gautheret (1945) for tissue cultures on agar, where 0.5 gm. inoculum grew to a 150-gm. mass in 300 days (0.5 gm./day). Melchers and Engelmann (1955) reported good results for liquid cultures of carrot tissue that produced 3.7 gm. of tissue from a 20-mg. inoculum in 95 days (40 mg./day). These yields are much less than those obtained for the carboy cultures (3.0 gm. day). The main difference is in the heavy inocula used for the carboy cultures and the fact that these inocula are transferred serially in liquid media prior to use. The lag phase of growth is decreased in the carboy cultures, and this contributes to an improved yield.

Analyses

In collaboration with L. H. Weinstein, Boyce Thompson Institute, Yonkers, N. Y., analyses of the tissue cultures as grown in test tubes were compared with analyses of the plant part from which they were derived. The comparisons were made for free amino acids, combined amino acids, nonvolatile organic acids, sugars, and nucleic acids. Since a tissue culture represents a segment of the whole plant, diverted in its normal function and removed from some of the controls of the parent plant, both similarities and differences were anticipated and subsequently found. The most complete work to date has been with *Agave toumeyana* leaves and a culture from the leaves. However, these results are now published (Weinstein *et al.*, 1959) and will not be presented in detail here. Based on these biochemical analyses, it is concluded that the tissue culture is cytologically, physiologically, and biochemically dis-

tinct from the parent plant part. Outstanding differences were found in the content of free and combined hydroxyproline, the ratios of malate to citrate, of ribonucleic (RNA) to deoxyribonucleic (DNA) acid, and of free glucose, fructose, and sucrose. A number of unknown organic and amino acids were found; some were common to both the tissue culture and the plant parts, and others were found in only one.

One comparison was made between the holly tissue grown on agar and the same tissue grown in the aerated carboy culture. It was found that the malic/citric ratio was reversed: malic acid predominating in the carboy culture and citric acid in the test tube cultures. Of the free amino acids, the carboy culture was found to contain about three times as much γ-aminobutyric acid as the tube cultures; 2 to 5 mg./gm. fresh weight of histidine, lysine, phenylalanine, and tyrosine was detected in the tissue from the carboy culture, where none was found in the tube cultures. Of the protein amino acids, the lysine level was double that in the tube cultures. The sugar composition was essentially the same in both cultures. There was considerably more RNA phosphorus and DNA phosphorus in the carboy cultures than in tube cultures. These results support the idea that these cultures respond to varied conditions of growth. It remains to be seen to what extent their ability to synthesize specific compounds may be regulated by modifying the chemical and physical environment.

Problems

There are a number of problems associated with the culture of plant cells under submerged conditions; some of these are concerned with the techniques of submerged cultures and others are peculiar to plant tissue culture in general. For example, the isolation of cultures in many laboratories has been done with the criterion of growth as the basis for selecting tissues. Any medium promoting growth finds wider and wider application. The net result is impressive growth, but it raises an important question, that is, the relation between the synthetic capacity of the cells and their ability to grow. It may be that a slower rate of growth on non-growth stimulating media may be a prerequisite for certain desirable functions.

In isolating plant tissues for the production of any given product, we are aware of the variability that will occur within a particular strain of tissue. Spontaneous changes leading to root formation, pigmentation, and accelerated growth rate are sometimes observed. One example is the isolation of a green strain of *Taxus* pollen tissues from an original white tissue (Tulecke, 1959). A comparison of the absorption spectra of acetone extracts of these two tissues with extracts of the leaves of *Taxus* is shown in FIGURE 2. The difference in absorption indicates a fundamental change in pigment composition. Contrasted with this is the close correlation between the absorption curves for extracts of a green pollen tissue from *Pseudolarix amabilis* and the leaves of this plant. Such changes in

tissues as those seen in the *Taxus* tissue are a problem when stable strains are required. It may be possible to minimize these difficulties by establishing clones of tissue from single cells (Muir *et al.*, 1958 and Braun, 1959); attention to the type of medium used, as suggested by Torrey and Shigemura (1957), may also help. It is equally probable that these variant cultures may be of use in the search for new desirable strains; this problem of variant cultures might actually be exploited by the induction of variations of biochemically desirable types, followed by appropriate selection and stabilization.

Another aspect of the problem of variation in tissue cultures is the storage of cultures. We have been successful in storing the tissues of *Agave, Datura, Ilex, Phaseolus vulgaris, Rosa, Helianthus annuus, Ginkgo, Opuntia* sp., and *Rumex acetosa* for more than a month at 5 to 10° C. Upon removal from the cold, these cultures resume growth very readily. One tissue, *Dioscorea composita,* did not survive the treatment. The use of low temperature, or the mineral oil-layering technique of Caplin (1959), would be helpful not only in reducing the number of transfers, but in minimizing the variations that occur during continuous subcultures.

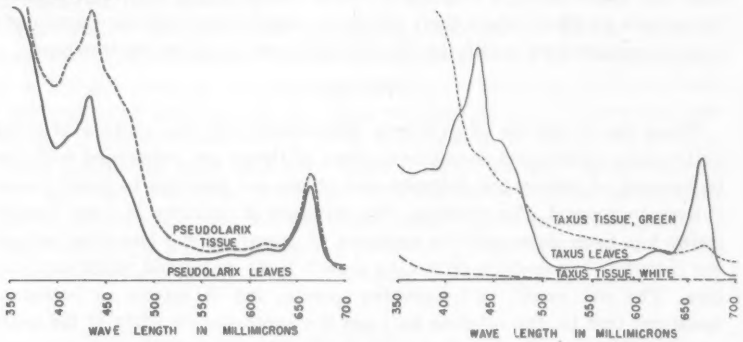

FIGURE 2. Absorption curves for green plant tissue cultures and leaves of the intact plants. The original *Taxus* tissue was white; the green *Taxus* tissue arose as a spontaneous variant from the white culture. The extract of green leaves was obtained from *Taxus baccata.* The *Pseudolarix amabilis* tissue was isolated as a green tissue. Both cultures are derived from pollen.

Hildebrandt *et al.* (1945) and Skoog (1944) have demonstrated an increased growth rate as a result of increased temperature for tobacco hybrid tissue; the optimum temperature is 32 to 33° C. The growth response of several of our tissues at three temperatures is shown in TABLE 3. *Rosa* alone tolerates a temperature of 31 to 32° C; it also grows at a much faster rate than the other tissues. *Lolium* has an optimum at 20 to 21° C, and *Ilex* and *Ginkgo* (not shown on TABLE 3) have an optimum at 27 to 28° C. Unfortunately, these temperature requirements

TABLE 3

THE EFFECT OF TEMPERATURE ON THE GROWTH OF PLANT TISSUE CULTURES

Tissue	Growth values at three temperatures		
	20 to 21° C.	27 to 28° C.	31 to 32° C.
Persea	7.7	9.6	6.0
Rosa	29.5	35.7	34.6
Portulaca	11.6	15.4	7.4
Lolium	29.8	25.3	dead
Dioscorea	8.0	8.0	dead

were not satisfied for the carboy cultures, but it is assumed they would increase the growth rate and the yields.

In the early stages of the development of the carboy culture technique, contamination was rather frequent and expected. Later, the carboys were set up with confidence, and there was a relatively small chance of loss through contamination. Of the 15 carboy cultures, 9 were maintained sterile for 3 to 6 weeks; 6 of the cultures were contaminated in earlier work, several of these intentionally. Some contamination was encountered in attempting to sterilize 9 l. of medium in the carboy; this was especially true of media containing yeast extract. To circumvent this, we found it advantageous to sterilize the carboy separately and add the medium in 1-l. amounts. Our attempts to use motor-driven propellers to agitate the cultures usually ended in contamination. As a result, we turned to air agitation, which proved satisfactory. Moreover, our results indicate that good aeration is necessary for the best growth of certain cell lines. Comparable results are reported for animal cells (Cooper *et al.*, 1958).

The substitution of tap water for the distilled water usually used in plant tissue culture work had no adverse effect on the growth of *Rosa*, *Lolium*, *Ilex*, or *Ginkgo* tissues.

The constant bubbling of air produced an abundance of foam in certain media, especially those containing yeast extract. This was effectively controlled without toxicity to the cells through the use of a DCA silicone (Dow Corning Antifoam A). This was used at the rate of 3 gm. per 10 l.

Antibiotics are not employed for plant tissue cultures in any routine manner, as in the case for many microbial and animal cell cultures. The numerous manipulations involved in the use of the large volume cultures made it desirable to investigate the tolerance by plant cells of effective levels of common antibiotics. TABLE 4 shows that penicillin and Oleandomycin are not inhibitory and could be used. Streptomycin is toxic to all cultures; this is unfortunate because the common contaminants in the

TABLE 4

THE GROWTH OF PLANT TISSUE CULTURES IN LIQUID MEDIA IN THE PRESENCE OF ANTIBIOTICS

Antibiotic	*Concentration (ppm)*	*Tissue cultures*		
		Ginkgo	*Holly*	*Rose*
Streptomycin	10	0	+	+
Penicillin	20	+++++	+++++	+++++
Terramycin	5	0	+++++	+++++
Oleandomycin	20	+++++	+++++	+++++
Bacitracin	50	+++++	+++++	+
Neomycin	1	+	+++++	+
Thiolutin	1	0	0	0

Key: +++++ equals growth equivalent to control without antibiotic.

large cultures were Gram-negative organisms. Because of its broad spectrum, Terramycin would be the antibiotic of choice; it is strongly inhibitory to the *Ginkgo* tissue, but does not affect growth of the other tissues.

Several improvements in the carboy culture system are suggested. The use of round-bottom reaction flasks (Corning Glass Works) instead of the flat-bottom carboys would permit better agitation and aeration. The suggestion of Melchers and Bergmann (1959) for the use of a water condenser at the air vent would eliminate the evaporation of medium; the water vapor would be returned to the carboy. In place of Seitz filters for the sterilization of air, cylinders packed with glass wool have been used successfully. The use of a pressure regulator is also desirable to assure a continuous flow of air.

Conclusions

For the first time, perhaps, it is possible to think in terms of a chemostatic culture of higher plant cells. The methods described here for the propagation of 10 or more liters of plant cell cultures should be adaptable to a continuous cell generator such as those used for microbes and more recently for animal cells. Samples can be withdrawn and the medium replenished. The carboy cultures offer the advantages of aseptic conditions, a controlled environment, and a homogeneous tissue. The yields reported here are considered a good beginning, but are not indicative of the best results that could be obtained under optimal conditions of combined temperature, strain selection, medium design, aeration, and healthy inoculum. It is our feeling that these techniques will be useful for studies of basic cell functions, the role of precursors in particular synthetic

pathways, enzymatic reactions, and the production of known desirable compounds; they may also be employed for the propagation and study of obligate parasitic fungi and plant nematodes. In essence, these cell cultures represent a new class of microorganisms – plant cells freed from the controls of the parent plant – subject to the regulation and curiosity of the investigator.

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CONFERENCES HELD

SECTION OF BIOLOGICAL AND MEDICAL SCIENCES

NONNARCOTIC DRUGS FOR THE RELIEF OF PAIN AND THEIR MODE OF ACTION

Friday, December 4 and
Saturday, December 5, 1959

Conference Chairman: Frank M. Berger
Wallace Laboratories, New Brunswick, N. J.

FRIDAY, DECEMBER 4, 1959

Session Chairman: Chauncey D. Leake
Ohio State University, College of Medicine, Columbus, Ohio

9:00 A.M.-
Greetings from the Academy - Robert L. Kroc, Chairman, Section of Biological and Medical Sciences, The New York Academy of Sciences, New York, N. Y.; Warner-Lambert Research Institute, Morris Plains, N. J.

"The Purpose of the Conference" - Frank M. Berger, Wallace Laboratories, New Brunswick, N. J.

"Neurophysiology of Pain" - Ralph Gerard, University of Michigan, Ann Arbor, Mich.

"Some Psychological Aspects of Pain and the Relief of Suffering" - Asenath Petrie, Harvard Medical School and the Boston Sanatorium, Cambridge, Mass.

"The Clinical Measurement of Pain" - Louis Lasagna, Johns Hopkins University, Baltimore, Md.

"The Pharmacology of Salicylates and Related Compounds" - Paul K. Smith, George Washington University, Washington, D.C.

"Therapeutic Actions of Salicylate" - James Reid, Western Infirmary, Glasgow, Scotland.

"Visceral Receptors and Visceral Pain" - Robert K. S. Lim, Miles Laboratories, Elkhart, Ind.

Session Chairman: Dale G. Friend
Peter Bent Brigham Hospital, Boston, Mass.

2:00 P.M.-

"The History, Chemistry, and Pharmacology of Carisoprodol" - Frank M. Berger, Wallace Laboratories, New Brunswick, N. J.

"The Mode of Action of Carisoprodol" - José del Castillo, University of Puerto Rico School of Medicine, San Juan, P. R.

"A Comparative Evaluation of Nonnarcotic Analgesics in Pain Induced by Ultrasonic Stimulation" - Audrey R. Holliday and J. Dille, University of Washington Medical School, Seattle, Wash.

"Biochemical Pharmacological Considerations of Zoxazolamine and Chlorzoxazone" - Allan Conney, National Heart Institute, Public Health Service, Bethesda, Md.

"Comparative Effects of Certain Nonnarcotic Central Nervous System Analgesics and Muscle Relaxants on the Pituitary Adrenal Cortical System" - Ernest M. Gold, Vincent C. DiRaimondo, John R. Kent, and Peter H. Forsham, University of California Medical Center, San Francisco, Calif.

"Pharmacology of Phenyramidol (IN511) with Emphasis on the Analgesic and Muscle Relaxant Actions" - Thomas B. O'Dell, Research Laboratories, Irwin, Neisler & Company, Decatur, Ill.

"Utilization of Phenyramidol Hydrochloride for Clinical Analgesia" - Robert C. Batterman, Institute for Clinical Pharmacology and Medical Research, Berkeley, Calif.

SATURDAY, DECEMBER 5, 1959

Session Chairman: Houston Merritt
Columbia University College of Physicians and Surgeons, New York, N.Y.

9:00 A.M.-

"Evaluation of Neurospasmolytic Agents as Measured by Objective Means" - Irving M. Levine and Dale G. Friend, Harvard University Medical School, Boston, Mass., and the Boston Regional Veterans' Administration Clinic, Boston, Mass.

"Evaluation of Nonnarcotic Chemical Agents in Headaches" - Arnold Friedman, Montefiore Hospital, New York, N. Y.

"The Role of Carisoprodol in Physical Medicine" - Arthur Jones, University of Oregon, Portland, Ore.

"The Effect of Carisoprodol in General Postoperative Surgery" - Ralph Adams, Huggins Hospital, Wolfeboro, N. H.

"The Rationale of Treatment of Motor Disorders with Muscle Relaxants"- Edward B. Schlesinger, Neurological Institute, Columbia University, New York, N. Y.

"Clinical Evaluation of Carisoprodol in Handicapped Children" (moving picture) - Catherine E. Spears, Medical Director of Child Evaluation Center and Easter Seal Rehabilitation Center, Morristown, N. J.

"The Effect of Carisoprodol on Muscle Spasm and Pain Associated with Dental Syndromes" - Laszlo Schwartz, Columbia University School of Dentistry, New York, N. Y.

"The Use of Phenyramidol in Obstetrics and Gynecology" - Amos S. Wainer, Castallo-Wainer Clinic for Women, Philadelphis, Pa.

Session Chairman: Bernard B. Brodie
National Heart Institute, Public Health Service, Bethesda, Md.

2:00 P.M.-
"Biochemical Pharmacological Considerations of Phenylbutazone and its Analogues" - J. J. Burns, National Institutes of Health, Public Health Service, Bethesda, Md.

"Pharmacology of Phenylbutazone Derivatives" - R. Domenjoz, Pharmacological Institute, University of Bonn, Bonn, Germany.

"Therapy of Gout with Phenylbutazone and Sulfinpyrazone" - Alexander B. Gutman, Mount Sinai Hospital, New York, N. Y.

"Phenylbutazone and Oxyphenylbutazone in Rheumatoid Arthritis"- Charley J. Smyth, University of Colorado, Denver, Colo.

"The Effect of Oxyphenylbutazone on Pain Related to Vascular Disease" - Irwin D. Stein, Mount Vernon, N. Y.

"The Effect of Oxyphenylbutazone on Postsurgical Pain" - James F. Connell, Jr., St. Vincent's Hospital, New York, N. Y.

Robert L. Kroc
Chairman

Charles Noback
Vice-Chairman

SECTION OF BIOLOGICAL AND MEDICAL SCIENCES AND SECTION OF CHEMICAL SCIENCES

CHELATION PHENOMENA

Monday, December 7, 1959
Tuesday, December 8, 1959

Conference Co-Chairmen:

Jerome F. Fredrick, The Dodge Chemical Company (Boston), Research Laboratories, New York, N. Y.

Arthur E. Martell, Department of Chemistry, Clark University, Worcester, Mass.

MONDAY, DECEMBER 7, 1959

THE CHEMISTRY OF CHELATION

Session Chairman: Harry Kroll, Division of Neoplastic Diseases, Montefiore Hospital, New York, N. Y.

9:00 A.M.-
Greetings from the Academy - Robert L. Kroc, Chairman, Section of Biological and Medical Sciences, The New York Academy of Sciences, New York, N. Y.; Warner-Lambert Research Institute, Morris Plains, N. J.

"Chelation: Stability and Sensitivity" - Arthur E. Martell, Department of Chemistry, Clark University, Worcester, Mass.

"Indicative Properties of a Ferric Chelate" - Saul Solloway, Department of Chemistry, City College of New York, New York, N. Y.; Faberge, Inc., Ridgefield, N. J.

"Metal Binding by Polyelectrolytes" - Harry P. Gregor, Department of Chemistry, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

"Formation of Polynuclear Complexes in Aqueous Solution" - Arthur E. Martell and Richard Gustafson, Department of Chemistry, Clark University, Worcester, Mass.

"Carboxylation Reactions Catalyzed by Chelating Metals" - Martin Stiles, Department of Chemistry, University of Michigan, Ann Arbor, Mich.

"Effect of Structural Modifications of Polyaminoacetic Acids on the Chelation of Metal Ions of Biological Interest" - Harry Kroll, Division of Neoplastic Diseases, Montefiore Hospital, New York, N. Y.

THE BIOLOGICAL SIGNIFICANCE OF CHELATION

Session Chairman: Jerome F. Fredrick,
The Dodge Chemical Company (Boston), Research Laboratories,
New York, N. Y.

2:00 P.M.-

"Binding of Metallic Cations by Peptides and Proteins" - Frank R. N. Gurd, Department of Biochemistry, Cornell University Medical College, New York, N. Y.

"The Copper Proteins" - Charles R. Dawson, Department of Chemistry, Columbia University, New York, N. Y.

"Effect of Synthetic Chelating Agents on Carboxylating Enzymes" - Arthur Wallace, Department of Horticultural Sciences, University of California, Los Angeles, Calif.

"The Role of Metals in the Activation of Phosphorylase" - E. S. Krebs and Edmond H. Fischer, Department of Biochemistry, University of Washington School of Medicine, Seattle, Wash.

"Preliminary Studies on Algal Phosphorylase-Manganese Chelate" - Jerome F. Fredrick, The Dodge Chemical Company (Boston), Research New York, N. Y.

"Influence of Chelation in Determining the Reactivity of the Iron in Hemoproteins, and the Cobalt in Vitamin B12 Derivatives" - Philip George, Dennis H. Irvine and Stanley C. Glauser, Department of Chemistry, University of Pennsylvania, Philadelphia, Pa.

"Use of Metal Chelates for Plant Tissue Culture" - Richard M. Klein and Georgia E. Manos, The New York Botanical Garden, Bronx, N. Y.

TUESDAY, DECEMBER 8, 1959

MEDICAL APPLICATIONS OF CHELATING AGENTS

Session Chairman: Murray Weiner,
Medical Division, Geigy Research Laboratories,
Geigy Chemical Corp., Ardsley, N. Y.

9:00 A.M.-

"Clinical Uses and Applications of Chelating Agents" - Murray Weiner, Medical Division, Geigy Research Laboratories, Geigy Chemical Corp., Ardsley, N. Y.

"Studies of the Effect of Chelating Agents in Man"-Herta Spencer, Division of Neoplastic Diseases, Montefiore Hospital, New York, N. Y.

"Synthetic Chelates and Iron Metabolism" - Martin Rubin, Georgetown University Medical School, Washington, D. C.

"The Pathogenesis of Anemia with an Iron Chelate" - Samuel Korman, Division of Neoplastic Diseases, Montefiore Hospital, New York, N. Y.

"Binding of Yttrium Chelates by Serum Constituents" - Betty Rosoff, Division of Neoplastic Diseases, Montefiore Hospital, New York, N. Y.

"Effect of Excess Chelating Agents on Rare-Earth Decontamination" - Hiram Hart, Department of Physics, City College of New York, New York, N. Y.

"The Mobilization and Excretion of Lead in Cattle: A Comparative Study of Various Chelating Agents" - Paul B. Hammond, Division of Pharmacology, University of Minnesota College of Veterinary Medicine, St. Paul, Minn.

INDUSTRIAL APPLICATIONS OF CHELATING AGENTS

Session Chairman: Saul Solloway,
Department of Chemistry, City College of New York, New York, N. Y.,
Faberge, Inc., Ridgefield, N. J.

2:00 P.M.-

"Use of Chelating Agents in Chemical Processing" - S. Peter Belis, American Cyanamid Company, New York, N. Y.

"Stabilization of Tetracycline and Oxytetracycline Solutions by Metal Chelation" - Melvin Noseworthy, Pharmaceutical Research Laboratories, Chas. Pfizer and Co., Brooklyn, N. Y.

"Chelation and Catalysis" - A. K. Prince, Research Laboratories, Dow Chemical Company, Midland, Mich.

"Metal Acetylacetonates: Applications" - Headlee Lamprey, Research Laboratories, Union Carbide Metals Company, Niagara Falls, N. Y.

"Maintaining Food Quality with Chelating Agents" - H. L. Aamouth and F. J. Butt, Dow Chemical Company, Midland, Mich.

SECTION OF BIOLOGICAL AND MEDICAL SCIENCES

Robert L. Kroc, *Chairman* — Charles Noback, *Vice-Chairman*

SECTION OF CHEMICAL SCIENCES

Karl Folkers, *Chairman* — Frederick R. Eirich, *Vice-Chairman*

SECTION OF BIOLOGICAL AND MEDICAL SCIENCES

THE RETICULOENDOTHELIAL SYSTEM (RES)

Thursday, December 10 and
Friday, December 11, 1959

Conference Co-Chairmen:

John H. Heller, New England Institute for Medical Research
Ridgefield, Conn.

Albert S. Gordon, Graduate School of Arts and Sciences
New York University, New York, N. Y.

THURSDAY, DECEMBER 10, 1959

DEFINITION AND MORPHOLOGIC ASPECTS OF THE RES

Session Chairman: John H. Heller
New England Institute for Medical Research, Ridgefield, Conn.

9:00 A.M. –
Greetings from the Academy – Robert L. Kroc, Chairman, Section of Biological and Medical Sciences, The New York Academy of Sciences, New York, N. Y.; Warner-Lambert Research Institute, Morris Plains, N. J.

"Introductory Remarks" – John F. Loutit, Atomic Energy Research Establishment, Harwell, Berkshire, England.

"Reaction Patterns of RES under Stimulation" – R. N. Baillif, Tulane University School of Medicine, New Orleans, La.

"Influence of the RES and Other Cells on the Metabolic Fate of Steroids" – D. L. Berliner, University of Utah College of Medicine, Salt Lake City, Utah.

"Skin Windows and RES Activity" – John W. Rebuck, Division of Hematology, Henry Ford Hospital, Detroit, Mich.

"Activation of Capillary Endothelium" – Bela Gozsy and Lazlo Kato, Institute of Microbiology, University of Montreal, Montreal, P.Q., Canada.

FACTORS INFLUENCING RES ACTIVITY

Session Chairman: Thomas F. Dougherty
University of Utah College of Medicine, Salt Lake City, Utah

2:00 P.M. –
"Chemical Methods of Stimulation of the RES" – J. F. Snell, Pfizer Therapeutic Institute, Maywood, N. J.

"Hormones and the RES" – Thomas F. Dougherty, Department of Anatomy, University of Utah College of Medicine, Salt Lake City, Utah.

"RES and Thyroid Function: Its Relation to Resistance and Infection" – Max B. Lurie, Henry Phipps Institute, University of Pennsylvania, Philadelphia, Pa.

"RES and Passive Transfer of Endotoxin Tolerance" – Henry H. Freedman, Princeton Laboratories, Inc., Princeton, N. J.

"Endotoxin and Adrenocortical Hormones and Their Relation to the RES" – Edward H. Kass, Boston City Hospital, Boston, Mass.

"Nontoxic RES Stimulatory Lipids" – John H. Heller, New England Institute for Medical Research, Ridgefield, Conn.

7:30 P.M. –

"Problems Concerning the Role of the RES in Disease" – Lewis Thomas, New York University College of Medicine, New York, N. Y.

FRIDAY, DECEMBER 11, 1959

RES RELATIONS TO INFECTION AND IMMUNE REACTIONS

Session Chairman: Antonio Rottino
St. Vincent's Hospital, New York, N. Y.

9:00 A.M. –

"The RES in Antibody Formation" – Robert Wissler, Frank Fitch, and Mariano La Via, University of Chicago, Chicago, Ill.

"The RES in Experimental Malaria and Trypanosomiasis" – Frans C. Goble, Research Department, CIBA Pharmaceutical Products Inc., Summit, N. J.; and Ira Singer, The Rockefeller Institute, New York, N. Y.

"RES and Nonspecific Resistance" – Diethelm H. Böhme, Department of Pathology, The New York Hospital, New York, N. Y.

"Bacterial Phagocytosis by the RES *in Vivo* under Different Immune Conditions" – B. Benacerraf, New York University College of Medicine, New York, N. Y.

"RES and Host-Parasite Relationship" – Warren R. Pistey, New England Institute for Medical Research, Ridgefield, Conn.

RES RELATIONS TO STRESS, ORGANIC METABOLISM, AND GROWTH PROCESSES

Session Chairman: Albert S. Gordon
Graduate School of Arts and Science, New York University
New York, N. Y.

2:00 P.M. –

"RES and Tolerance to Stress" – B. W. Zweifach, New York University College of Medicine, New York, N. Y.

"Humoral Modification of RES Function" – Sherwood M. Reichard, Albert S. Gordon, New York University, New York, N. Y.; and Carl F. Tessmer, Armed Forces Institute of Pathology, Washington, D. C.

"Possible Role of the RES in Protein Transport" – Chester Hyman, University of Southern California, Los Angeles, Calif.

"Lipids and the RES" – Sanford O. Byers, Ray H. Rosenman, and Meyer Friedman, Harold Brunn Institute, Mount Zion Hospital, San Francisco, San Francisco, Calif.

"Isolation and Lipid Composition of Kupffer and Parenchymal Cells in Normal and Hyperlipemic States" – Nicholas R. Di Luzio, University of Tennessee, Memphis, Tenn.

"Studies on RES Functions in Relation to Growth Processes" – Kurt Stern, Mount Sinai Medical Research Foundation, Chicago, Ill.

"The RES and the Neoplastic Process" – Lloyd J. Old and Donald A. Clarke, Sloan-Kettering Institute for Cancer Research, New York, N. Y.

Robert L. Kroc
Chairman

Charles Noback
Vice-Chairman

NEW MEMBERS

Elected December 15, 1959

SUSTAINING MEMBERSHIP

Dandridge, William Shelton, M.D., Orthopedic Surgery. Lecturer, Oklahoma Baptist Hospital, Muskogee, Okla.

Edelman, Philip Michael, M.D., Diseases of Metabolism. Resident Physician in Internal Medicine, Cornell Division, Bellevue and Memorial Hospitals, New York, N. Y.

Lee, Lucy, M.D., Biological and Medical Sciences. Anesthesiologist, The Cooper Hospital, Camden, N. J.

ACTIVE MEMBERSHIP

Aronson, Alfred Lars, M.D., Biological and Medical Sciences. Assistant in Medicine, New York University College of Medicine, New York, N. Y.

Asinger, Friedrich, Dr. Ing., Chemical Sciences. Professor, Institut für Chemische Technologie der Technischen Hochschule, Aachen, Germany.

Barclay, Eugene S., B.S., Production. Director, Biological Laboratories, Merck Sharp & Dohme, Inc., Rahway, N. J.

Barquist, Richard F., M.D., Internal Medicine. Chief, Field Studies Branch, U.S. Army Medical Research Laboratory, Fort Knox, Ky.

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